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Mears, Andrew David
Withers & Rogers LLP
4 More London Riverside
London SE1 2AU
ROYAUME UNI

Date

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1210 / 1934971

Applicant/Proprietor
Voicebox Technologies, Inc.

Your request dated

Your request cannot be granted anymore, since

☐ the patent application has been refused or withdrawn or is deemed to have been withdrawn.

☐ the period for filing an opposition against the granted patent has expired or opposition proceedings before the EPO have been completed. The matter is now the sole responsibility of the national Offices of the designated Contracting States (see Articles 2(2), 64 EPC and Guidelines A-XI, 4).

If you do not agree with this finding, you may apply for an **appealable decision** within a period of **two months** from notification of this communication. If you do not apply for a decision within the prescribed period, your request will be placed on file and any administrative fee paid will be reimbursed.

For the Legal Division

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MICROSOFT CORP.
EXHIBIT 1006

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European Patent Office
Office européen des brevets

Closure of the procedure in respect of application No. 06814053.2 - 1210 06.03.18

✓ **1. The procedure in respect of the above application is closed for the following reason:**

REFU 2/24.11.17 The time limit under Art.108 EPC has expired.
No notice of appeal under Article 108 and Rule 99 EPC has been filed. No request for a decision under Rule 112(2), or for further processing under Article 121 EPC or for re-establishment of rights under Article 122 EPC has been filed.

✓ **2. The EPASYS situation has been verified in respect of item 1:**

DFIL: 31.08.06

NOAP: ////

RDEC: ////

RFPR: //

REES: ///

REFU 3/ADW 3 and DEAD 1 coded. Date of legal effect 23.09.17

✓ **3. Position regarding fees:**

FEFS01	002	00314430	26.03.08	EUR	810,00
DEST03	005	00314430	26.03.08	EUR	560,00
EXAM02	006	00314430	26.03.08	EUR	1 335,00
CLMS(2)	015	00314430	26.03.08	EUR	405,00
FFEE01	020	00314430	26.03.08	EUR	95,00
RFEE 03	033	00314430	26.03.08	EUR	400,00
RFEE 04	034	00404786	25.08.09	EUR	500,00
RFEE 05	035	00800962	19.08.10	EUR	735,00
RFEE 06	036	00867215	24.08.11	EUR	945,00
RFEE 07	037	00896469	23.08.12	EUR	1 105,00
RFEE 08	038	00925083	08.08.13	EUR	1 215,00
RFEE 09	039	01041468	27.08.14	EUR	1 380,00
RFEE 10	040	01058693	10.08.15	EUR	1 560,00
RFEE 11	041	01136790	31.08.16	EUR	1 575,00
ASOC03	055	00314430	26.03.08	EUR	25,00

☐ Examination started on 19.05.14 (EXDS51).

☐ Refund(s) ordered:

☐ 100% EXAM fee** ☐ 75% EXAM fee** ☐ 50% EXAM fee**

☐ DEST fee* ☐ RFEE(s): _____ ☐ Other fees: _____

Note: Attention is to be paid to potential automated refund proposal(s).

* Refund of DEST fee if date of legal effect is before/on SEPU or PACT6 date.

* * PLEASE REVIEW REFUND OF EXAMINATION FEE (100% or 75% or 50%)

✓ **4. Mark "DEAD" on the paper file and:**

☐ Check whether a divisional application is pending and if so attach the DEAD file to it.

☐ Any **models** still in the Office's possession were returned on _____
(for dealing with models, please refer to Fil d'Ariane).

☐ Keep paper file in file store (separate place) until next action for file destruction.

07.03.2018 Wagner, Judit

Date Formalities Officer

EPO Form 2058 11.16

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RECEIVED
29 NOV 2017

Date: 24.11.2017

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1914 / 1934971

Applicant/Proprietor: Voicebox Technologies, Inc.

EPA/EPO/OEB Formblatt/Form/Formulaire : 2007/ 2916/ 2019/ set of claims

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

With reference to the Notice in OJ EPO 7/2010, 377, you are requested to date and sign the acknowledgement of receipt and return it to the EPO **immediately**:

Conformément au communiqué paru au JO OEB 7/2010, 377, vous êtes prié d'indiquer sur le récépissé la date de réception du document, de signer le récépissé et de le renvoyer **sans délai** à l' OEB:

- **über die Online-Dienste des EPA** (als Anlage zu EPA Form 1038) / **through EPO Online Services** (as annex to EPO Form 1038) / **par les services en ligne de l'OEB** (en tant que pièce jointe au formulaire OEB 1038),
- **per Fax / by fax / par téléfax (+49 (0) 89 2399-4465 or +31 (0) 70 340-3016)**
- oder per Post / or by post / ou par courrier.

Empfangen am / Received on / Reçu le :
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01 DEC 2017

Unterschrift / Signature:

Empfangsberechtigter/authorised recipient/
le destinataire ou la personne dûment mandatée

Rücksende-Adresse / Return address / Adresse de retour
(Umschlag / envelope / enveloppe ISO C4 / DL / C6/C5 / C6)

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DEUTSCHLAND

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EPA/EPO/OEB Form 2936 08.10

Received at the EPO on Dec 01, 2017 17:20:31. Page 1 of 1
Duration: 12.01.2017 05:19:53 PM - 12.01.2017 05:20:31 PM. This page 1 of 1 was completed at 12.01.2017 05:20:31 PM

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Date: 24.11.2017

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1914 / 1934971

Applicant/Proprietor: Voicebox Technologies, Inc.

EPA/EPO/OEB Formblatt/Form/Formulaire : 2007/ 2916/ 2019/ set of claims

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

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- **über die Online-Dienste des EPA** (als Anlage zu EPA Form 1038) / **through EPO Online Services** (as annex to EPO Form 1038) / **par les services en ligne de l'OEB** (en tant que pièce jointe au formulaire OEB 1038),
- **per Fax / by fax / par téléfax (+49 (0) 89 2399-4465 or +31 (0) 70 340-3016)**
- oder per Post / or by post / ou par courrier.

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Unterschrift / Signature:

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EPA/EPO/OEB Form 2936 08.10

CLAIMS

1. A system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

an audio capture device configured to receive a natural language utterance and generate an electronic signal corresponding to the natural language utterance; and

a speech interpretation engine coupled to the audio capture device and configured to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

map the recognized phoneme stream to one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine;

map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar; and

generate a preliminary interpretation of the natural language utterance based on the mapping of the recognised phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements.

2. The system of claim 1, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

3. The system of claim 2, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

4. The system of claim 3, wherein the acoustic grammar includes an unstressed central vowel linking element between the constrained transitions to reduce a search space associated with the speech interpretation engine.

5. The system of claim 4, wherein the unstressed central vowel comprises a *schwa* acoustic element.

6. The system of claim 1, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

7. The system of claim 6, wherein to generate the plurality of candidate interpretations, the sharpening engine is further configured to:

identify a plurality of words or phrases in the grammar tree that possibly map to the one or more syllables; and

provide the identified plurality of words or phrases to a plurality of domain agents configured to:

identify one or more suspect words or phrases in the identified plurality of words or phrases, wherein the one or more suspect words or phrases have phonetic similarities to information in domain contexts associated with the plurality of domain agents;

identify one or more closest phonetic matches to the one or more suspect words or phrases using closest-distance metrics associated with M-Tree weighted models in the domain contexts associated with the plurality of domain agents; and

substitute the one or more closest phonetic matches for the one or more suspect words or phrases to generate the plurality of candidate interpretations.

8. The system of claim 7, wherein the sharpening engine is configured to identify the plurality of words or phrases in the grammar tree that possibly map to the one or more syllables using a context associated with the natural language utterance, criteria identified in the natural language utterance, a history of previous natural language utterances, user profile information, or domain specific information.

9. A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances, the method comprising:

phonemically representing one or more acoustic elements in an acoustic language model, wherein the one or more acoustic elements include an unstressed central vowel;

phonemically representing one or more syllables in the acoustic language model, wherein the one or more acoustic elements further include a phoneme loop to phonemically represent the one or more syllables;

constructing an acoustic grammar that constrains transitions between the acoustic elements in the phoneme loop, wherein the acoustic grammar constrains the transitions based on phonotactic rules associated with the acoustic language model; and

using the unstressed central vowel to link the constrained transitions between the acoustic elements in the phoneme loop.

10. The method of claim 9, wherein the one or more acoustic elements includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables.

11. The method of claim 10, the wherein unstressed central vowel comprises a *schwa* acoustic element.

12. A method for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

using an audio capture device configured to receive a natural language utterance to generate an electronic signal corresponding to the natural language utterance; and

using a speech interpretation engine coupled to the audio capture device to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

map the recognized phoneme stream one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine;

map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar; and generate a preliminary interpretation of the natural language utterance based on the mapping of the recognised phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements.

13. The method of claim 12, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

14. The method of claim 13, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

15. The method of claim 12, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words

or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

Minutes of oral proceedings

The oral proceedings was held in absence of representation following the notification of 22-8-2017. The examining division, noting that no further submission nor argument has been filed, confirmed all the objections raised in the summons for oral proceedings of 29-05-2017.

The examining division decided thus to refuse the application according to Article 97(2) EPC.

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Application No.: 06 814 053.2

Decision of the Examining Division

In the oral proceedings held on 23.10.2017, the examining division has decided:

The European patent application is refused on the basis of Article 97(2) EPC. The reasons for the decision are attached (Form(s) 2916).

13.11.17
Date

Lecomte, Michael
Chairman

Tilp, Jan
1st examiner

Krembel, Luc
2nd examiner

Enclosure(s): Form 2916
Claims 1-15 filed on 20-11-2014

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Formalities Officer
Name: Kolesar, Daniela
Tel: +49 89 2399 - 8133
or call
+31 (0)70 340 45 00

Substantive Examiner
Name: Tilp, Jan
Tel: +49 89 2399 - 4753

Application No.	Ref.	Date
06 814 053.2 - 1914	P110079EP-PCT	24.11.2017
Applicant: Voicebox Technologies, Inc.		

Decision to refuse a European Patent application

The Examining Division - at the oral proceedings dated 23.10.2017 - has decided:

European Patent application No. 06 814 053.2 is refused.

Applicant/s:
Voicebox Technologies, Inc.
11980 NE 24th Street
Suite 100
Bellevue, WA 98005
US

Title
DYNAMIC SPEECH SHARPENING

The grounds for the decision are set out on the supplemental sheets annexed hereto.

Means of redress

This decision is open to appeal.
Attention is drawn to the attached text of Articles 106 to 108 EPC and Rules 97 and 98 EPC.

Registered letter with advice of delivery
EPO Form 2007 12.07TRI

Examining Division:

Chairman:	Lecointe, Michael
2nd Examiner:	Krembel, Luc
1st Examiner:	Tilp, Jan

Kolesar, Daniela
Formalities Officer
Tel. No.: +49 89 2399-8133

Enclosure(s): 3 page/s reasons (Form 2916)
Form 2019
Claims 1-15 filed on 20-11-2014

to EPO postal service: 21.11.17

Registered letter with advice of delivery
EPO Form 2007 12.07TRI

I. Summary of Facts and Submissions

1 European patent application No. 06 814 053.2 having the title "DYNAMIC SPEECH SHARPENING" was filed on 31-08-2006. It claims priority of US 60/712,412 filed on 31-08-2005.

2 The applicant is VoiceBox Technologies, Inc., 11980 NE 24th Street, Suite 100, Bellevue, WA 98005, US.

3 In the letter received on 14-05-2008 the applicant requested that claims 1-19 as filed with the demand for international preliminary examination are taken as basis for Examination by the European Patent Office.

4 In a communication under Rule 62a(1) EPC issued on 12-05-2010, the applicant was (i) informed that independent claims 1 and 17 were in the same category and (ii) invited to indicate the claims complying with Rule 43(2) EPC on the basis of which the search should be carried out.

5 In the response received on 09-07-2010, the applicant indicated that the search should be carried out in respect of claims 9-19.

6 The European search opinion cited the documents

D1	BAZZI I ET AL: "Heterogeneous lexical units for automatic speech recognition: preliminary investigations", ACOUSTICS, SPEECH, AND SIGNAL PROCESSING, 2000. ICASSP '00. PROCEEDING S. 2000 IEEE INTERNATIONAL CONFERENCE ON 5-9 JUNE 2000, PISCATAWAY, NJ, USA,IEEE, vol. 3, 5 June 2000 (2000-06-05), pages 1257-1260, XP010507574, ISBN: 978-0-7803-6293-2
D2	US 6 470 315 B1 (NETSCH LORIN PAUL [US] ET AL) 22 October 2002 (2002-10-22)
D3	US 2004/193408 A1 (HUNT MELVYN J [GB]) 30 September 2004 (2004-09-30)
D4	O'SHAUGHNESSY D: "Interacting with computers by voice: automatic speech recognition and synthesis", PROCEEDINGS OF THE IEEE, IEEE. NEW YORK, US LNKD-DOI:10.1109/JPROC.2003.817117, vol. 91, no. 9, 1 September 2003 (2003-09-01), pages 1272-1305, XP011100665, ISSN: 0018-9219

and raised objections under (i) Article 84 EPC against claims 9, 14 and 15, (ii) Article 54(1) and (2) EPC against claim 9 and (iii) Article 56 EPC against claims 10-19.

7 In the response received on 12-04-2011 the applicant requested further examination on an amended set of claims 1-15 and provided arguments in support of the patentability of these claims.

8 In a communication under Article 94(3) EPC issued by the examining division on 26-05-2014, objections were raised under (i) Article 123(2) EPC against claims 1-15, (ii) Article 54(1) and (2) EPC against claims 1 and 12 and (iii) Article 56 EPC against claims 2-11 and 13-15.

9 In the response received on 20-11-2014 the applicant requested further examination on an amended set of claims 1-15 and provided arguments in support of the patentability of these claims. Moreover, in said response, a request for oral proceedings was submitted.

10 On 29-05-2017 the examining division issued a summons to attend oral proceedings on 23-10-2017. In the annex to the summons, objections were raised under (i) Article 123(2) EPC against claims 1-15, (ii) Articles 84 and 83 EPC against claim 9 and the corresponding parts of the description and (iii) Article 52(1) EPC against claims 1 and 12, wherein additional reference was made to document

D5 US 5 799 276 A (KOMISSARCHIK EDWARD [US] ET AL) 25 August 1998 (1998-08-25),

which was already cited in the international search report.

11 In a response to the summons received on 22-08-2017 the applicant informed the examining division that, on behalf of the applicant, no one would attend the scheduled oral proceedings.

12 On 23-10-2017, oral proceedings were held in the absence of the applicant (Rule 115(2) EPC).

13 The decision is based on the following request:

Description, Pages

1-16 as published

Claims, Numbers

1-15	filed in electronic form on	20-11-2014

Drawings, Sheets

1/3-3/3	as published

14 The claims under consideration are attached to this decision. As to the other application documents, reference is made to the file.

II. Reasons for the decision

15 **Article 123(2) EPC**

In item 3 of the annex to the summons, objections were raised under Article 123(2) EPC against claims 1-15. The applicant has not filed any amendment and/or argument to overcome these objections, which are thus maintained - i.e. **claims 1-15 do not fulfill the requirement of Article 123(2) EPC** for the reasons provided item 3 of the annex to the summons.

16 **Articles 83 and 84 EPC**

In item 4 of the annex to the summons, objections were raised under Articles 84 and 83 EPC against claim 9 and the corresponding parts of the description. The applicant has not filed any amendment and/or argument to overcome these objections, which are thus maintained - i.e. **claim 9 and the corresponding parts of the description do not fulfill the requirements of Article 84 and 83 EPC** for the reasons provided in item 4 of the annex to the summons.

17 **Article 52(1) EPC**

In item 5 of the annex to the summons, objections were raised under Article 52(1) EPC against claims 1 and 12. The applicant has not filed any amendment and/or argument to overcome these objections, which are thus maintained - i.e. **claims 1 and 12 do not meet the requirements of Article 52(1) EPC** for the reasons provided in item 5 of the annex to the summons.

Since, as shown above, the requirements of Article 123(2), 84, 83 and 52(1) EPC are not fulfilled, **the present application is refused under Article 97(2) EPC**.

Article 106
Decisions subject to appeal

(1) An appeal shall lie from decisions of the Receiving Section, Examining Divisions, Opposition Divisions and the Legal Division. It shall have suspensive effect.

(2) A decision which does not terminate proceedings as regards one of the parties can only be appealed together with the final decision, unless the decision allows a separate appeal.

(3) The right to file an appeal against decisions relating to the apportionment or fixing of costs in opposition proceedings may be restricted in the Implementing Regulations.

Rule 97
Appeal against apportionment and fixing of costs

(1) The apportionment of costs of opposition proceedings cannot be the sole subject of an appeal.

(2) A decision fixing the amount of costs of opposition proceedings cannot be appealed unless the amount exceeds that of the fee for appeal.

Rule 98
Surrender or lapse of the patent

The decision of an Opposition Division may be appealed even if the European patent has been surrendered in all the designated Contracting States or has lapsed in all those States.

Article 107
Persons entitled to appeal and to be parties to appeal proceedings

Any party to proceedings adversely affected by a decision may appeal. Any other parties to the proceedings shall be parties to the appeal proceedings as of right.

Article 108
Time limit and form

Notice of appeal shall be filed, in accordance with the Implementing Regulations, at the European Patent Office within **two months** of notification of the decision. Notice of appeal shall not be deemed to have been filed until the fee for appeal has been paid. Within **four months** of notification of the decision, a statement setting out the grounds of appeal shall be filed in accordance with the Implementing Regulations.

Further information concerning the filing of an appeal

(a) Notice of appeal can be filed in accordance with Rule 1 and Rule 2(1) EPC, by delivery by hand, by post, or by technical means of communication. The filing has to comply with the details and conditions and, where appropriate, any special formal or technical requirements laid down by the President of the European Patent Office (R. 99(3) EPC).

(b) The addresses of the filing offices of the European Patent Office are as follows:

(i) European Patent Office
D-80298 Munich
Germany

Fax: +49 89 2399-4465

(ii) European Patent Office
Postbus 5818
NL-2280 HV Rijswijk (ZH)
The Netherlands

Fax: +31 70 340-3016

(iii) European Patent Office
D-10958 Berlin
Germany

Fax: +49 30 259 01-840

(c) The notice of appeal must contain the name and address of the appellant in accordance with the provisions of Rule 41(2)(c) EPC, an indication of the decision impugned, and a request defining the subject of the appeal. In the statement of grounds of appeal the appellant shall indicate the reasons for setting aside the decision impugned, or the extent to which it is to be amended, and the facts and evidence on which the appeal is based (R. 99(1) and (2) EPC). The notice of appeal and any subsequent submissions stating the grounds for appeal must be signed (R. 50(3) EPC).

(d) The fee for appeal is laid down in the Rules relating to Fees. The schedule of fees and expenses of the EPO or a reference to the current version is regularly published in the Official Journal of the European Patent Office under the heading "Guidance for the payment of fees, expenses and prices". Fee information is also published on the EPO website under www.epo.org/fees.

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Application No.: 06 814 053.2

Minutes of the oral proceedings before the EXAMINING DIVISION

The proceedings were not public.

Proceedings opened on 23.09.2017 at 13:00 hours

Examining Division:

Chairman:	Lecointe, Michael
1st member:	Tilp, Jan
2nd member:	Krembel, Luc
Minute writer:	Krembel, Luc

Present as/for the applicant/s:

Nobody had appeared for the applicant/s. The chairman confirmed that the applicant/s had been duly summoned.

Essentials of the oral proceedings and relevant statements of the applicant/s:

After deliberation of the examining division, the chairman announced the following **decision**:

"The European patent application is refused."

Regarding the reasons for the decision, the chairman referred to:

Article 97(2) EPC: the application does not meet the requirements of Article/s 123(2),83,84,54(1)(2),56 EPC.

The chairman **closed the proceedings** on 23.09.2017 at 13:10 hours.

Lecointe, Michael
Chairman

Krembel, Luc
Minute Writer

Annex(es):

After deliberation of the examining division, the chairman announced the following **decision**:

"The European patent application is refused."

Regarding the reasons for the decision, the chairman referred to:

Article 97(2) EPC: the application does not meet the requirements of Article/s 123(2),83,84,54(1)(2),56 EPC.

The chairman **closed the proceedings** on 23.09.2017 at 13:10 hours.

signed:

Lecointe, Michael

Chairman

signed:

Krembel, Luc

Minute Writer

Enclosure(s):

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European Patent Office
Office européen des brevets

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or call
+31 (0)70 340 45 00

Application No.	Ref.	Date
06 814 053.2 - 1914	P110079EP-PCT	24.11.2017
Applicant Voicebox Technologies, Inc.		

Provision of a copy of the minutes in accordance with Rule 124(4) EPC

The attached copy of the minutes of the oral proceedings is sent to you in accordance with Rule 124(4) EPC.

Kolesar, Daniela
For the Examining Division
Tel. No.: +49 89 2399 - 8133

Enclosure(s): Copy of the minutes (Form 2009)

Registered Letter
EPO Form 2042 12.07TRI

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Date
05.10.17

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1914 / 1934971
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Notice drawing attention to Rule 51(2) EPC, Article 2 No. 5 of the Rules relating to Fees,
- Payment of the renewal fee plus additional fee -

The renewal fee for the 12. year fell due on 31.08.17 unless this date falls within the period covered by an interruption of the proceedings in accordance with Rule 142(1) EPC, or a request for re-establishment of rights is pending (Art. 122, R. 51(4) EPC).

The current rate of the renewal fee amounts to **EUR 1575,00** (see current Schedule of fees and costs).

The renewal fee was not paid by the due date.
The renewal fee may still be validly paid **up to the last day of the sixth calendar month** following the due date, provided that the additional fee (**50%** of the renewal fee) is paid at the same time, see OJ EPO 2008, 5.

Within the above period, which cannot be extended, the following fees are to be paid:

Renewal fee for the 12. year:	EUR	1575,00
Additional fee:	EUR	787,50
TOTAL AMOUNT	EUR	2.362,50

If the renewal fee and the additional fee are not paid in due time, the European patent application shall be deemed to be withdrawn (Art. 86(1) EPC).

Note to users of the automatic debiting procedure
The normal time limit for payment of the above renewal fee had already expired when the automatic debit order was received. The renewal fee and the surcharge will be debited automatically on the last day of the six-month period (supplementary publication 3 - OJ EPO 2015).

Important information concerning fee amounts
Following any amendment to the Rules relating to Fees, the amount(s) mentioned in this communication may be different from the amount(s) **actually due on the date of payment.** The latest version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (**www.epo.org**) and can be found under **www.epo.org/schedule-of-fees**, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.
Please note that procedural fees are usually adjusted every two years, on even years, with effect from 1 April.

Payments by cheque delivered or sent direct to the EPO are no longer accepted as from 1 April 2008 (see OJ EPO 2007, 626).

Important information in case of a PACE request
If, for an application being processed under the PACE programme the payment of the renewal fee has not been received by the due date stipulated in Rule 51(1) EPC, the accelerated prosecution of the application is suspended until the payment of the renewal fee with additional fee has been received (see OJ EPO 2015, A93, point 5).

For the Examining Division

Europäisches Patentamt
European Patent Office
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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	5552482
Application number	EP06814053.2
Date of receipt	22 August 2017
Receiving Office	European Patent Office, The Hague
Your reference	P110079EP
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) ep-sfd-request.xml ORAL-1.pdf\EPO letter.pdf (1 p.)
Submitted by	CN=Andrew Mears 48555
Method of submission	Online
Date and time receipt generated	22 August 2017, 09:17 (CEST)
Message Digest	AA:10:4D:4D:48:6F:63:9D:64:7E:99:C8:A1:0A:1D:FD:10:9A:A0:BB

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

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European Patent Office
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Letter accompanying subsequently filed items

Representative:

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10958 Berlin
Germany
Tel. +49(0)30 25901-0 | Fax -840

The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP

	Description of document	Original file name	Assigned file name
1	Letter dealing with Oral proceedings	EPO letter.pdf	ORAL-1.pdf

	Payment	
1	Mode of payment	Not specified

Signatures

Place:	
Date:	**22 August 2017**
Signed by:	**Andrew Mears 48555**
Representative name:	**Andrew MEARS**
Capacity:	**(Representative)**

withers & rogers LLP

Withers & Rogers LLP, 4 More London Riverside, London, SE1 2AU
Tel: +44 (0)20 7940 3600 Fax: +44 (0)20 7378 9680
E-Mail: admin@withersrogers.com Web: www.withersrogers.com

European & Chartered Patent Attorneys
Trade Mark Attorneys

Our Ref: P110079EP-PCT/AM

Your Ref:

European Patent Office
D-80298
München
Germany

18 August 2017

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 117 925 3030

Dear Sirs

European Patent Application No. 06814053.2
based on PCT/US2006/034184
Dynamic Speech Sharpening
VoiceBox Technologies, Inc

Further to the Summons to attend oral proceedings pursuant to Rule 115(1) EPC dated 29 May 2017, we confirm we will not be attending the oral proceedings.

Yours faithfully

Andrew Mears
Professional Representative
WITHERS & ROGERS LLP

Withers & Rogers LLP is a limited liability partnership registered in England and Wales (registered number OC310992) with its principal place of business and registered office at 4 More London Riverside, London, SE1 2AU. Regulated by IPReg.

Also at 1 Redcliff Street, Bristol, BS1 6NP Tel: +44 (0)117 925 3030 Fax: +44 (0)117 925 3530
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Derwent House, 150 Arundel Gate, Sheffield, S1 2FN Tel: +44 (0)114 273 3400 Fax: +44 (0)114 275 5788 and
Steinerstr. 15, building A, D-81369 Munich, Germany Tel: +49 (0)89 50222 4020

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- 2 JUN 2017

Mears, Andrew David
Withers & Rogers LLP
4 More London Riverside
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ROYAUME UNI

Date: 29.05.2017

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1914 / 1934971
Applicant/Proprietor: Voicebox Technologies, Inc.	

EPA/EPO/OEB Formblatt/Form/Formulaire : 2008, 2906

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

With reference to the Notice in OJ EPO 7/2010, 377, you are requested to date and sign the acknowledgement of receipt and return it to the EPO **immediately**:

Conformément au communiqué paru au JO OEB 7/2010, 377, vous êtes prié d'indiquer sur le récépissé la date de réception du document, de signer le récépissé et de le renvoyer **sans délai** à l' OEB:

- **über die Online-Dienste des EPA** (als Anlage zu EPA Form 1038) / **through EPO Online Services** (as annex to EPO Form 1038) / **par les services en ligne de l'OEB** (en tant que pièce jointe au formulaire OEB 1038),
- **per Fax / by fax / par téléfax (+49 (0) 89 2399-4465 or +31 (0) 70 340-3016)**
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6/6/2017

Unterschrift / Signature:

Empfangsberechtigter/authorised recipient/
le destinataire ou la personne dûment mandatée

Rücksende-Adresse / Return address / Adresse de retour
(Umschlag / envelope / enveloppe ISO C4 / DL / C8/C5 / C6)

Europäisches Patentamt
80298 MÜNCHEN
DEUTSCHLAND

Rücksende-Adresse / Return address / Adresse de retour

EPA/EPO/OEB Form 2936 08.10

Duration: 06.06.2017 10:00:01 - 06.06.2017 10:00:10. This page 1 of 1 was completed at 06.06.2017 10:00:10
Received at the EPO on Jun 06, 2017 10:00:10. Page 1 of 1

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European Patent Office
80298 MUNICH
GERMANY

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Contact Customer Services at www.epo.org/contact

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ROYAUME UNI

Date: 29.05.2017

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1914 / 1934971

Applicant/Proprietor: Voicebox Technologies, Inc.

EPA/EPO/OEB Formblatt/Form/Formulaire : 2008, 2906

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

With reference to the Notice in OJ EPO 7/2010, 377, you are requested to date and sign the acknowledgement of receipt and return it to the EPO **immediately**:

Conformément au communiqué paru au JO OEB 7/2010, 377, vous êtes prié d'indiquer sur le récépissé la date de réception du document, de signer le récépissé et de le renvoyer **sans délai** à l' OEB:

- **über die Online-Dienste des EPA** (als Anlage zu EPA Form 1038) / **through EPO Online Services** (as annex to EPO Form 1038) / **par les services en ligne de l'OEB** (en tant que pièce jointe au formulaire OEB 1038),
- **per Fax / by fax / par téléfax (+49 (0) 89 2399-4465 or +31 (0) 70 340-3016)**
- oder per Post / or by post / ou par courrier.

Empfangen am / Received on / Reçu le :

Unterschrift / Signature:

Empfangsberechtigter/authorised recipient/
le destinataire ou la personne dûment mandatée

Rücksende-Adresse / Return address / Adresse de retour
(Umschlag / envelope / enveloppe ISO C4 / DL / C6/C5 / C6)

Europäisches Patentamt
80298 MÜNCHEN
DEUTSCHLAND

Rücksende-Adresse / Return address / Adresse de retour

EPA/EPO/OEB Form 2936 08.10

AD22840

The examination is being carried out on the **following application documents**

Description, Pages

1-16 as published

Claims, Numbers

1-15 filed in electronic form on 20-11-2014

Drawings, Sheets

1/3-3/3 as published

1 Reference is made to the following letters and communications. The numbering will be adhered to in the rest of the procedure:

R2: applicant's letter of 20.11.2014

C2: official communication of 26.05.2014

R1: applicant's letter of 11.04.2011

C1: European search opinion of 28.09.2010

2 Despite the provision of further amended claims and observations filed with R2, the examining division is still of the opinion that the **claims as presently on file are not allowable under Articles 123(2), 84, 83 and 52(1) EPC**. Following C2 pursuant to Article 94(3) EPC, the examining division thus deems expedient to appoint oral proceedings in accordance with Article 116(1) EPC.

The issues to be discussed during the oral proceedings are the following:

3 **Article 123(2) EPC**

3.1 Independent claims 1 and 12

3.1.1 According to R2, page 1, first bullet point and paragraph below, the applicant regards paragraphs [006], [007] and [023] of the application as filed as basis for the expression "A system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances" comprised in lines 1 and 2 of present amended claim 1.

The examining division does not agree with the applicant, because it is not directly and unambiguously derivable from the paragraphs referred to by the applicant that the specific features of the speech interpretation engine according to claim 1, lines 5-16 (clean copy) may provide noise toleration capabilities (in addition to providing out-of-vocabulary interpretation capabilities achievable by phoneme recognition, for which a basis is seen in paragraph [009], lines 7-9 of the application as filed).

3.1.2 In the applicant's view, as set out in R2, page 2, third bullet point and paragraph below, the feature "map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar", which has been newly introduced to claim 1, lines 12 and 13 (clean copy), is based on the abstract as well as paragraphs [024], [025] and [030] of the application as filed.

The examining division does not share the applicant's view for the following reasons:

(i) According to the headnote of decision T0246/86 of the Boards of Appeal, "the abstract is intended solely for documentation purposes (Article 85 EPC) and does not form part of the disclosure of the invention. It may not be used to interpret the content of the application for the purposes of Article 123(2) EPC." The applicant's referral to the abstract is thus not taken into account for assessing compliance of claim 1 with the requirement of Article 123(2) EPC.

(ii) Paragraphs [024] and [025] are not concerned with "unstressed vowel linking elements", contrary to the claimed mapping feature recited above. Moreover, paragraph [025] discloses a linking element included in a phoneme loop (see lines 2-3 of paragraph [025] on page 8 of the application as filed), whereas present claim 1 does not comprise such phoneme loop.

(iii) Paragraph [030], first sentence, refers to - and is thus to be read together with - the approach described in figure 2 and paragraph [029]. The feature of a grammar tree with a linking element that will merge after a first segment and then spread out again at a second segment (see sentence bridging pages 9 and 10) has been omitted from present amended claim 1 without a basis for such omission being recognizable in paragraphs [029] and [030].

(iv) It cannot be derived directly and unambiguously from paragraph [030] that a "part of a speech signal", as addressed in lines 2-3 of said paragraph, can be equated with a recognised phoneme stream. Consequently, the mapping of said "part of a speech signal" according to paragraph [030], lines 2-3, is not considered a valid basis for the claimed mapping of the recognized phoneme stream.

3.1.3 In view of the findings set out items 3.1.1 and 3.1.2 above, the combination of features defined by present amended **claim 1 (accordingly corresponding claim 12)** is not considered originally disclosed (cf. Guidelines H-V, 3.2) and thus **not allowable in the sense of Article 123(2) EPC**.

3.2 Independent claim 9

3.2.1 According to R2, page 2, last-but-one bullet point and paragraph below, the applicant regards the abstract and paragraphs [010], [025], [026], [029] and [030] of the application as filed as basis for the expression "A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances" comprised in lines 1 and 2 of present claim 9.

While disregarding the applicant's referral to the abstract (see item 3.1.2 (i) above), the examining division notes that all paragraphs cited by the applicant are specifically concerned with reducing a search space for a phonemic acoustic grammar, in light of which the claimed "recognition grammar" represents an intermediate generalization, for which no basis is recognizable in said paragraphs.

3.2.2 According to R2, page 2, last bullet point and page 3, first paragraph, the applicant regards paragraphs [010], [024], [025] and [030], lines 1-8 of the application as filed as basis for the expression "phonemically representing one or more acoustic elements in an acoustic language model, wherein the one or more acoustic elements include an unstressed central vowel" claimed in lines 3 and 4 of present claim 9.

The examining division does not acknowledge this, because:

(i) Lines 1-8 of paragraph [030] do not allow to directly and unambiguously derive that the acoustic grammar disclosed therein is synonymous with the presently-claimed acoustic language model.

(ii) Paragraph [030], lines 5-6, provide a basis for the unstressed central vowel schwa being used, but not for any other unstressed central vowel, contrary to what is presently claimed.

(iii) Paragraph [030] is to be read together with paragraph [0029], as already pointed out in item 3.1.2 (iii) above, and paragraph [029] specifically discloses including linking elements in a phonemic acoustic grammar to reduce the number of transition states, wherein a grammar tree will merge after a first segment and then spread out at a second segment (see paragraph [029], second and third sentences). These features are omitted from the above-recited phonemically representing and from all other features of present claim 9 without a basis for such omission being recognizable in any of the passages of the originally-filed application as referred to by the applicant.

3.2.3 In view of the findings set out items 3.2.1 and 3.2.2 above, the combination of features defined by present claim 9 is not considered originally disclosed (cf. Guidelines H-V, 3.2), either. **Claim 9** is thus **deficient under Article 123(2) EPC**.

3.3 Dependent claims 2-8, 10, 11 and 13-15

Contrary to the requirement of Rule 137(4) EPC, a respective basis has not yet been indicated for the feature combinations of present amended dependent claims 2-8, 10, 11 and 13-15. Therefore, **compliance of the dependent claims with Article 123(2) EPC is not approved**.

4 Articles 84 and 83 EPC

4.1 Independent claim 9

The examining division is of the opinion that **claim 9 does not meet the requirements of Articles 84 and 83 EPC, because the subject-matter claimed in claim 9 is neither clear nor disclosed in a manner sufficiently clear and complete** for it to be carried out by a person skilled in the art.

In particular, claim 9 now claims in lines 1-2 "reducing a search space for a recognition grammar", but it is not clear from the wording of claim 9 (Article 84 EPC) how the claimed "reducing a search space" is achieved

The description states that "the phoneme loop may include a linking element to reduce a size of a search space associated with the grammar" (see second sentence of paragraph [025] on page 8). However, the description does not disclose at all (Article 83 EPC) how said inclusion of a linking element in the phoneme loop can actually reduce the size of a search space associated with a recognition grammar. [NB: A sufficiently clear and complete disclosure for reducing a size of a search space is only provided for the case of the

recognition grammar being represented by a tree in which linking elements are included (see figure 2 together with paragraph [029]). Such recognition grammar tree is, however, not comprised in the definition of present claim 9.)

5 Article 52(1) EPC

In view of the plurality of objections under Articles 123(2), 84 and 83 EPC, it cannot be anticipated what an independent claim potentially complying with these Articles could look like. It is thus not deemed expedient to further discuss or assess at the current stage of the procedure the questions of novelty and/or inventive step beyond the reasoning already provided in items 3-6 of C1 and the following additional remarks:

5.1 Claims 1 and 12 in view of D1 (XP10507574) and D2 (US 6,470,315 B1)

Concerning the applicant's argument with respect to claim 1 in view of D1 (see R2, paragraph with two bullet points bridging pages 3 and 4),

(i) the examining division maintains the opinion that D1 shows a mapping of the recognized phoneme stream to syllables, as formulated in the context of the feature analysis given in C1, and

(ii) in view of *D1 and D2, column 3, line 44 to column 4, line 4*, the mapping of the recognized phoneme stream to unstressed vowel linking elements phonemically represented in the acoustic grammar and the claimed generation of a preliminary interpretation is still considered obvious (see also C1, item 4.1 and note the corrected reference to D2 given above). Notwithstanding the deficiencies under Article 123(2) EPC (see item 3.1 above), **claim 1 (accordingly claim 12) does not fulfill the requirements of Article 52(1) EPC, because the subject-matter of claim 1 (accordingly claim 12) is not considered to involve an inventive step in the sense of Article 56 EPC over the disclosure of D1 and D2.**

5.2 Further prior art under Article 54(2) EPC

The following document

D5 US 5 799 276 A (KOMISSARCHIK EDWARD [US] ET AL) 25 August 1998 (1998-08-25)

- which was already cited in the international search report and the numbering of which will be adhered to in the rest of the procedure, - has been re-assessed and is now found to be of particular relevance, as further illustrated below.

5.3 Claims 1 and 12 in view of D5

Document D5 is considered to disclose - using the present wording of claim 1:

"A system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

an audio capture device configured to receive a natural language utterance and generate an electronic signal corresponding to the natural language utterance *(see D5, figures 1, 3 and column 8, lines 46-52)*; and

a speech interpretation engine coupled to the audio capture device and configured to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance *(see D5, column 10, lines 22 and 47-51)*;

map the recognized phoneme stream to one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine *(see D5, column 10, lines 59-61 (mapping to words implying syllables) in view of column 11, line 33 to column 12, line 8 (words represented in acoustic grammar))*;

map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar *(see D5, column 13, lines 45-46 and column 38, lines 56-66)*; and

generate a preliminary interpretation of the natural language utterance based on the mapping of the recognised phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements *(see D5, column 10, lines 61-67 (word hypothesis represents preliminary interpretation))*."

Consequently, notwithstanding the deficiencies under Article 123(2) EPC (see item 3.1 above), **claim 1 (accordingly claim 12) does not meet the requirements of Article 52(1) EPC, since its subject-matter is not new in view of D5 in the sense of Article 54(1) and (2) EPC**.

6 Concluding remark

The applicant may well request a decision in accordance with the state of the file at any time (cf. Guidelines C-V, 15.1). If no longer interested in attending the requested oral proceedings, the applicant is kindly advised to withdraw the request for oral proceedings.

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European Patent Office
80298 MUNICH
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Application No.: 06 814 053.2

Preparation for oral proceedings - Instructions to Support Service

Oral proceedings are to be held in connection with the above patent application

1. The matters to be discussed are set out in the annex (Form 2906)

2. Dispatch the summons using Form 2008/2310 and Form 2906 for the parties to attend on:

Day 23.10.2017 Time 13:00

Archibus

Conference Room booked

ORAL 01, 02, 03 and 05 coded

De 2 3. 05. 17
Date Initials

2.1 Parties' submissions in preparation for the oral proceedings, if any, should be made no later than

1 month(s)

before the date of the oral proceedings
(transfer to Form 2008.1 /2310.1)

2.2 Encode ORAL(04) coded

De 2 3. 05. 17
Date Initials

2.3 Dispatch Form 2008.7 /2310.7 to division

De 2 3. 05. 17
Date Initials

3. ☐ Arrange for the following special equipment to be provided in the conference room:

Date Initials

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel: +49 89 2399 0
Fax: +49 89 2399 4465

4. Return the dossier to primary examiner with Form 2041 (15 days before the oral proceedings)

Date Initials

17.05.17
Date

Lecomte, Michael
Chairman

Krembel, Luc
2nd examiner

Tilp, Jan
1st examiner

Legal member

Enclosure(s):

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European Patent Office
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GERMANY

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Mears, Andrew David
Withers & Rogers LLP
4 More London Riverside
London SE1 2AU
ROYAUME UNI

Date
29.05.2017

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1914 / 1934971

Applicant/Proprietor
Voicebox Technologies, Inc.

Summons to attend oral proceedings pursuant to Rule 115(1) EPC

You are hereby summoned to attend oral proceedings arranged in connection with the above-mentioned European patent application.

The matters to be discussed are set out in the communication accompanying this summons (EPO Form 2906).

The oral proceedings, which will not be public, will take place before the Examining Division

on 23.10.17 at 13.00 hrs at the EPO,
PschorrHöfe, Bayerstr. 34, 80335 Munich

No changes to the date of the oral proceedings can be made, except on serious grounds (see OJ EPO 1/2009, 68). If you do not appear as summoned, the oral proceedings may continue without you (R. 115(2) EPC, see also OJ EPO 10/2008, 471).

Your attention is drawn to Rule 4 EPC, regarding the language of the oral proceedings, and to the Special edition No. 3 OJ EPO 2007, L.1., concerning the filing of authorisations for company employees and lawyers acting as representatives before the EPO.

The final date for making written submissions and/or amendments (R. 116 EPC) is 22.09.17.

The actual room number as well as the waiting room numbers will be given to you by the porter in the foyer at the above EPO address.

Parking is available in the underground car park, accessible only via the entrance "Grasserstrasse 2/6". On presentation of the summons to oral proceedings at one of the porters' lodges in the PschorrHöfe, the parking ticket will be revoked.

1st Examiner:
Tilp J

2nd Examiner:
Krembel L

Chairman:
Lecointe M

For the Examining Division

Annexes:
Confirmation of receipt (Form 2936)
Communication (EPO Form 2906)

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Registered letter with advice of delivery

to EPO postal service: 23.05.17

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GERMANY

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4 More London Riverside
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ROYAUME UNI

Date
25.11.16

Reference	Application No./Patent No.
P110079EP-PCT	06814053.2 - 1910 / 1934971
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication of amended entries concerning the representative (R. 143(1)(h) EPC)

As requested, for the above-mentioned European patent application / European patent the entries concerning the representative have been amended as follows:

Mears, Andrew David
Withers & Rogers LLP
4 More London Riverside
London SE1 2AU
GB

The amendment will be recorded in the Register of European Patents.

For the Examining Division

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY

Questions about this communication ?
Contact Customer Services at www.epo.org/contact

Beck, Simon Antony
Withers & Rogers LLP
4 More London Riverside
London SE1 2AU
ROYAUME UNI

Date
25.11.16

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1910 / 1934971
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication in response to your enquiry received on 21.11.16

☑ The EPO will be able to supply a communication within 07 month(s).

☐ Having regard to the current workload, the EPO will not be able to supply a communication within the next 12 months.

☐ Reference is made to the telephone consultation that took place on .

If the proposed time frame does not meet your needs, please contact the responsible examiner or the director:

Primary Examiner (substantive examination)
Name: Tilp J
Tel.: +49 (0)89 2399 - 4753

Director
Name:
Tel.: +49 (0)89 2399 -

General information:
If you wish your application to be examined more quickly than the time frame indicated above, your attention is drawn to the possibility of requesting accelerated examination under the "PACE" programme of the EPO (OJ EPO 2015, A93). However, if a request for accelerated examination has already been filed and the application has been removed from the PACE programme, a second request for accelerated examination can no longer be processed (OJ EPO 2015, A93, point 4).

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	4817176
Application number	EP06814053.2
Date of receipt	21 November 2016
Receiving Office	European Patent Office, The Hague
Your reference	P110079EP-PCT
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) EPLETT-1.pdf\P110079EP-PCT_status enquiry.pdf (1 p.) ep-sfd-request.xml epf1012.pdf (1 p.)
Submitted by	CN=Andrew Mears 48555
Method of submission	Online
Date and time receipt generated	21 November 2016, 17:58 (CET)
Message Digest	86:9C:97:F4:44:D3:14:9E:31:8A:B5:A9:6B:6F:31:A8:60:F1:71:DC

Correction by the EPO of errors in debit instructions filed by eOLF
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Enquiry as to the processing of the file

I/we hereby enquire when the EPO will deliver the (supplementary) European search report / next communication[1]

for application/patent 06814053.2

[1] OJ EPO 2016, A66

Signatures

Place:	
Date:	**21 November 2016**
Signed by:	**Andrew Mears 48555**
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Our Ref: P110079EP-PCT/AM/KGM

Your Ref:

European Patent Office
D-80298
München
Germany

21 November 2016

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Writer's Telephone: +44 117 925 3030

Dear Sirs

European Patent Application No. 06814053.2
based on PCT/US2006/034184
Dynamic Speech Sharpening
VoiceBox Technologies, Inc

A considerable amount of time has passed since we filed a response. Please would you let me know when I can expect to receive the results of examination of that response.

Yours faithfully

Andrew Mears
Professional Representative
WITHERS & ROGERS LLP

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP-PCT

Request:

- Enquiry as to the processing of the file

	Description of document	Original file name	Assigned file name
1	Enquiry as to the processing of the file – electronically generated		EPF1012.PDF
2	Letter relating to the search and examination procedure	P110079EP-PCT_status enquiry.pdf	EPLETT-1.pdf

	Payment	
1	Mode of payment	Not specified

Signatures

Place:	
Date:	**21 November 2016**
Signed by:	**Andrew Mears 48555**
Representative name:	**Andrew MEARS**
Capacity:	**(Representative)**

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FAX MESSAGE

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COMPANY: European Patent Office

FAX NO: 0049 89 2399 4465

YOUR REF:

NO. OF PAGES (INCLUDING COVER): 3

FROM: Andrew Mears

DATE: 17 November 2016

OUR REF: M523536/AM

SUBJECT: **Bulk Change of Principal Named Representative**

Message:

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Our Ref: M523536/AM/KGM

Your Ref:

17 November 2016

Writer's Telephone: +44 117 925 3030

Dear Sirs

Bulk Change of Principal Named Representative

Please change the principal named representative as shown in the table below.

Please also update our case references as shown on the attached.

Application No.	First Applicant	AREF	New Representative
EP14818642.2	RealD Inc.	P120939EP-PCT	Andrew Mears
EP14754036.3	Real D Inc.	P121898EP-PCT	Andrew Mears
EP11820925.3	Commonwealth Scientific and Industrial Research Organisation	P115866EP-PCT	Andrew Mears
EP06814053.2	Voicebox Technologies, Inc.	P110079EP-PCT	Andrew Mears
EP11841660.1	Tibco Software Inc	P117332EP-PCT	Andrew Mears
EP11841062.0	Tibco Software Inc.	P117335EP-PCT	Andrew Mears
EP10830904.8	Skywave Antennas Inc.	P115662EP-PCT	Andrew Mears
EP12850100.4	Commonwealth Scientific and Industrial Research Organisation	P118712EP-PCT	Andrew Mears
EP07839482.2	RealD Inc.	P111297EP-PCT	Andrew Mears
EP05797853.8	RealD Inc.	P111160EP-PCT	Andrew Mears
EP12150510.1	RealD Inc.	P108436EP-PCTD1	Andrew Mears
EP10800306.2	RealD Inc.	P115106EP-PCT	Andrew Mears
EP10807299.2	RealD Inc.	P115458EP-PCT	Andrew Mears
EP11735201.3	RealD Inc.	P116012EP-PCT	Andrew Mears
EP12782590.9	RealD Inc.	P117950EP-PCT	Andrew Mears
EP14157548.0	Analog Devices Global	P118507EP	Andrew Mears
EP14732715.9	Analog Devices, Inc.	P120748EP-PCT	Andrew Mears
EP14188331.4	Analog Devices Global	P119024EP	Andrew Mears
EP15186014.5	Analog Devices Global	P120504EP	Andrew Mears
EP15189732.9	Analog Devices, Inc.	P120652EP	Andrew Mears

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Derwent House, 150 Arundel Gate, Sheffield, S1 2FN Tel: +44 (0)114 273 3400 Fax: +44 (0)114 275 5788 and
Steinerstr. 15, building A, D-81369 Munich, Germany Tel: +49 (0)89 50222 4020

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	3137015
Application number	EP06814053.2
Date of receipt	20 November 2014
Receiving Office	European Patent Office, The Hague
Your reference	P110079EP-PCT
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) CLMS-HWA-1.pdf\Claims - marked up.pdf (5 p.) ep-sfd-request.xml CLMS-1.pdf\Claims - clean.pdf (5 p.) EXRE3-1.pdf\Response.pdf (4 p.)
Submitted by	CN=A. Lowe 32387,O=Withers & Rogers LLP,C=GB
Method of submission	Online
Date and time receipt generated	20 November 2014, 15:41 (CET)
Message Digest	67:B3:79:21:FF:81:63:8E:4E:7D:76:0C:DA:46:5C:65:58:AA:4D:C5

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Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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CLAIMS

1. A system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

an audio capture device configured to receive a natural language utterance and generate an electronic signal corresponding to the natural language utterance; and

a speech interpretation engine coupled to the audio capture device and configured to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

~~characterised in that the speech interpretation engine is further reconfigured to~~ map the recognized phoneme stream to one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine; ~~and~~

map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar; and

generate a preliminary interpretation of the natural language utterance, ~~wherein the generated preliminary interpretation includes the one or more syllables mapped to the recognized phoneme stream~~based on the mapping of the recognised phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements.

2. The system of claim 1, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

3. The system of claim 2, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the

one or more syllables based on phonotactic rules associated with the acoustic language model.

4. The system of claim 3, wherein the acoustic grammar includes an unstressed central vowel linking element between the constrained transitions to reduce a search space associated with the speech interpretation engine.

5. The system of claim 4, wherein the unstressed central vowel comprises a *schwa* acoustic element.

6. The system of claim 1, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

7. The system of claim 6, wherein to generate the plurality of candidate interpretations, the sharpening engine is further configured to:

identify a plurality of words or phrases in the grammar tree that possibly map to the one or more syllables; and

provide the identified plurality of words or phrases to a plurality of domain agents configured to:

identify one or more suspect words or phrases in the identified plurality of words or phrases, wherein the one or more suspect words or phrases have phonetic similarities to information in domain contexts associated with the plurality of domain agents;

identify one or more closest phonetic matches to the one or more suspect words or phrases using closest-distance metrics associated with M-Tree weighted models in the domain contexts associated with the plurality of domain agents; and

substitute the one or more closest phonetic matches for the one or more suspect words or phrases to generate the plurality of candidate interpretations.

8. The system of claim 7, wherein the sharpening engine is configured to identify the plurality of words or phrases in the grammar tree that possibly map to the one or more syllables using a context associated with the natural language utterance, criteria identified in the natural language utterance, a history of previous natural language utterances, user profile information, or domain specific information.

9. A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances, the method comprising:

phonemically representing one or more acoustic elements in an acoustic language model, wherein the one or more acoustic elements include an unstressed central vowel;

phonemically representing one or more syllables in the acoustic language model, wherein the one or more acoustic elements further include a phoneme loop to phonemically represent the one or more syllables;

constructing an acoustic grammar that constrains transitions between the acoustic elements in the phoneme loop, wherein the acoustic grammar constrains the transitions based on phonotactic rules associated with the acoustic language model; and

using the unstressed central vowel to link the constrained transitions between the acoustic elements in the phoneme loop.

10. The method of claim 9, wherein the one or more acoustic elements includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables.

11. The method of claim 10, the wherein unstressed central vowel comprises a *schwa* acoustic element.

12. A method for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

using an audio capture device configured to receive a natural language utterance to generate an electronic signal corresponding to the natural language utterance; and

using a speech interpretation engine coupled to the audio capture device to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

map the recognized phoneme stream one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine; ~~and~~

map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar; and

generate a preliminary interpretation of the natural language utterance~~, wherein the generated preliminary interpretation includes the one or more syllables mapped to the recognized phoneme stream~~ based on the mapping of the recognised phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements.

13. The method of claim 12, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

14. The method of claim 13, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

15. The method of claim 12, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

CLAIMS

1. A system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

an audio capture device configured to receive a natural language utterance and generate an electronic signal corresponding to the natural language utterance; and

a speech interpretation engine coupled to the audio capture device and configured to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

map the recognized phoneme stream to one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine;

map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar; and

generate a preliminary interpretation of the natural language utterance based on the mapping of the recognised phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements.

2. The system of claim 1, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

3. The system of claim 2, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

4. The system of claim 3, wherein the acoustic grammar includes an unstressed central vowel linking element between the constrained transitions to reduce a search space associated with the speech interpretation engine.

5. The system of claim 4, wherein the unstressed central vowel comprises a *schwa* acoustic element.

6. The system of claim 1, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

7. The system of claim 6, wherein to generate the plurality of candidate interpretations, the sharpening engine is further configured to:

identify a plurality of words or phrases in the grammar tree that possibly map to the one or more syllables; and

provide the identified plurality of words or phrases to a plurality of domain agents configured to:

identify one or more suspect words or phrases in the identified plurality of words or phrases, wherein the one or more suspect words or phrases have phonetic similarities to information in domain contexts associated with the plurality of domain agents;

identify one or more closest phonetic matches to the one or more suspect words or phrases using closest-distance metrics associated with M-Tree weighted models in the domain contexts associated with the plurality of domain agents; and

substitute the one or more closest phonetic matches for the one or more suspect words or phrases to generate the plurality of candidate interpretations.

8. The system of claim 7, wherein the sharpening engine is configured to identify the plurality of words or phrases in the grammar tree that possibly map to the one or more syllables using a context associated with the natural language utterance, criteria identified in the natural language utterance, a history of previous natural language utterances, user profile information, or domain specific information.

9. A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances, the method comprising:

phonemically representing one or more acoustic elements in an acoustic language model, wherein the one or more acoustic elements include an unstressed central vowel;

phonemically representing one or more syllables in the acoustic language model, wherein the one or more acoustic elements further include a phoneme loop to phonemically represent the one or more syllables;

constructing an acoustic grammar that constrains transitions between the acoustic elements in the phoneme loop, wherein the acoustic grammar constrains the transitions based on phonotactic rules associated with the acoustic language model; and

using the unstressed central vowel to link the constrained transitions between the acoustic elements in the phoneme loop.

10. The method of claim 9, wherein the one or more acoustic elements includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables.

11. The method of claim 10, the wherein unstressed central vowel comprises a *schwa* acoustic element.

12. A method for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

using an audio capture device configured to receive a natural language utterance to generate an electronic signal corresponding to the natural language utterance; and

using a speech interpretation engine coupled to the audio capture device to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

map the recognized phoneme stream one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine;

map the recognised phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar; and generate a preliminary interpretation of the natural language utterance based on the mapping of the recognised phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements.

13. The method of claim 12, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

14. The method of claim 13, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

15. The method of claim 12, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words

or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP-PCT

	Description of document	Original file name	Assigned file name
1	Amended claims (clean copy)	Claims - clean.pdf	CLMS-1.pdf
2	Amended claims with annotations	Claims - marked up.pdf	CLMS-HWA-1.pdf
3	Reply to examination report	Response.pdf	EXRE3-1.pdf

Signatures

Place:

Date: **20 November 2014**

Signed by: **GB, Withers & Rogers LLP, A. Lowe 32387**

Capacity: **(Representative)**

Withers & Rogers LLP

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Our Ref: P110079EP-PCT/AL/TB

Your Ref:

European Patent Office
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Germany

20 November 2014

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Dear Sirs

European Patent Application No. 06814053.2 based on PCT/US2006/034184
Dynamic Speech Sharpening
VoiceBox Technologies, Inc

Further to the Communication pursuant to Article 94(3) EPC dated 26 May 2014, we enclose herewith amended claims and provide the following comments.

The basis for each feature in amended claim 1 is given as follows.

- *"A system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances"*

See paragraph 23 of the application as filed ("Phonemic recognition provides several benefits, particularly in the embedded space, such as offering out-of-vocabulary (OOV) capabilities ... [and] other advantages."); and paragraphs 6-7 ("[S]peech interpretation engines still have substantial problems with accuracy and interpreting words that are not defined in a predetermined vocabulary or grammar context. Poor quality microphones, extraneous noises, ... may also cause shortcomings in accuracy ... In light of these and other problems, there is a need for enhanced automated speech interpretation that may interpret natural human speech with an augmented accuracy.").

- *"an audio capture device configured to receive a natural language utterance and generate an electronic signal corresponding to the natural language utterance"*

See Abstract of the application as filed; original claim 16 ("[A] device that receives a user verbalization and generates an electronic signal corresponding to the user verbalization"); and paragraph 39 ("The received user verbalization may be electronically captured at operation 312, such as by a microphone or other electronic audio capture device.").

- *"analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance"*

See Abstract; paragraph 23 ("In one implementation ..., speech engine 112 may generate the preliminary interpretations [of the verbalization] by performing phonetic dictation to recognize a stream of phonemes"); and paragraph 31 ("[S]peech engine 112 may ... process the verbalization into a plurality of preliminary interpretations using the techniques described above. That is, the verbalization may be interpreted as a series of phonemes ...").

- *"map the recognized phoneme stream to one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine"*

See Abstract; paragraph 9 ("Phoneme recognition may be based on any suitable acoustic grammar that maps a speech signal into a phonemic representation."); and paragraph 24 ("Speech engine 112 may apply the phoneme stream against one or more acoustic grammars that reliably map a speech signal to a phonemic representation in order to generate the plurality of preliminary interpretations"); see also paragraph 31.

- *"map the recognized phoneme stream to one or more unstressed vowel linking elements phonemically represented in the acoustic grammar"*

See Abstract; and paragraph 30 (Using the approach described in Fig. 2, ... Part of a speech signal may be mapped to the linking element in order to maintain the phonotactic rules of the acoustic grammar. ... For example, a schwa represents an unstressed, central vowel in the English language. The phoneme schwa is an ideal linking element ..."); see also paragraphs 24-25 (describing examples of acoustic grammars that may be utilized, including grammars having linking elements to reduce a search space associated with the grammars).

- *"generate a preliminary interpretation of the natural language utterance based on the mapping of the recognized phoneme stream to the one or more syllables and the one or more unstressed vowel linking elements."*

See Abstract ("An acoustic grammar may be used to map the phonemes to syllables") and above cited sections of the application as filed and accompanying text; see also paragraphs 9, 24, 25 and 29.

Thus complete basis or all features of claim 1 is provided. Similarly, each feature in claim 9 is provided as follows.

- *"A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances"*

See Abstract ("[T]he acoustic grammar may include one or more linking elements to reduce a search space associated with the grammar."); see also paragraphs 10, 25, 26, 29 and 30.

- *"phonemically representing one or more acoustic elements in an acoustic language model, wherein the one or more acoustic elements include an unstressed central vowel"*

See paragraph 30 ("Using the approach described in Fig. 2, ... Part of a speech signal may be mapped to the linking element in order to maintain the phonotactic rules of the acoustic grammar. ... For example, a schwa represents an unstressed, central vowel in the English language .... The phoneme schwa is an ideal linking element"); see also paragraphs 10, 24 and 25.

- *"phonemically representing one or more syllables in the acoustic language model, wherein the one or more acoustic elements further include a phoneme loop to phonemically represent the one or more syllables"*

See paragraph 10 (describing an implementation where an acoustic grammar is represented by a loop of phonemes that may, for example, include a linking element between transitions); and paragraphs 24-25 ("For example, the English language may be mapped into a detailed acoustic grammar representing the phonotactic rules of English, where words may be divided into syllables ... The acoustic grammar may include a loop of phonemes").

- *"constructing an acoustic grammar that constrains transitions between the acoustic elements in the phoneme loop, wherein the acoustic grammar constrains the transitions based on phonotactic rules associated with the acoustic language model"*

The basis for this is the same as the previous feature, that is, paragraphs 10 and 24-25.

- *"using the unstressed central vowel to link the constrained transitions between the acoustic elements in the phoneme loop"*

See paragraph 10 ("[T]he speech engine may reduce the search space by reducing the number of transitions in a grammar tree .... For example, the phoneme loop may include a linking element between transitions."); see also paragraph 29 ("The grammar may further be improved by including linking elements to reduce the number of transition states").

Claim 12 as amended corresponds to claim 1 and thus has the same basis in the application as filed as claim 1.

The Applicant therefore submits that the current form of the claims has basis in the application as filed. The Applicant also submits that the independent claims 1, 9 and 12 are novel and inventive in view of cited document D1.

The Applicant notes that D1 does not teach or suggest at least the following features of claim 1:

- both the mapping of the recognized phoneme stream to syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine and the mapping of the recognized phoneme stream to unstressed vowel linking elements phonemically represented in the acoustic grammar; and

- generation of a preliminary interpretation of a natural language utterance (from which the phoneme stream is recognized) based on the mapping of the

recognized phoneme stream to the syllables and to the unstressed vowel linking elements.

In addition, the Applicant notes that the Examiner has not separately addressed the features of independent claim 9 in the Communication. However, the Applicant notes that D1 does not disclose or suggest at least the following features of claim 9:

- phonemically representation of acoustic elements (including an unstressed central vowel) in an acoustic language model and phonemically representation of syllabus in the acoustic model via a phoneme loop; and

- construction of a grammar that constrains transitions between the acoustic elements in the phoneme loop and links the constrained transitions using the unstressed central vowel.

The Applicant therefore believes that these features are novel and inventive in view of D1. Similarly, claim 12 is also novel and inventive as it relates to claim 9.

It is believed that the Application is in order for allowance. Oral proceedings are requested as a precaution should the Examiner be minded to refuse the application.

Yours faithfully

Alastair Lowe
Authorised Representative
WITHERS & ROGERS LLP

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY

Questions about this communication ?
Contact Customer Services at www.epo.org/contact

Beck, Simon Antony
Withers & Rogers LLP
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ROYAUME UNI

Date
03.09.14

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1910 / 1934971
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Extension of time limit pursuant to Rule 132(2) EPC

Examination procedure

With reference to your request, the time limit for replying to the communication pursuant to Article 94(3) EPC dated 26.05.14 has been extended

by 2 months

to a total of 6 months

from the date of notification of the above-mentioned communication.

Please note: To the extent that your request exceeded the above extension, your request has been refused.

Note
The granting of extensions to time limits is governed by the Implementing Regulations to the EPC and the Guidelines for Examination in the EPO, part E-VII, 1.6. A request for extension, which would result in the total period set exceeding six months, must be reasoned and supported by evidence.

If no reply to the communication is received in due time, the European patent application will be deemed to be withdrawn (Art. 94(4) EPC).

For the Examining Division

Europäisches Patentamt • European Patent Office • Office européen des brevets

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	2969624	
Application number	EP06814053.2	
Date of receipt	28 August 2014	
Receiving Office	European Patent Office, The Hague	
Your reference	P110079EP-PCT	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (1 p.)	ep-sfd-request.xml EXRE92-1.pdf\P110079EP-PCT - extension.pdf (1 p.)
Submitted by	CN=Simon Beck 12924	
Method of submission	Online	
Date and time receipt generated	28 August 2014, 18:23 (CEST)	
Message Digest	C6:2A:50:83:5F:BC:1E:92:02:73:BF:53:77:F4:91:03:1C:89:00:96	

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Europäisches Patentamt
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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP-PCT

	Description of document	Original file name	Assigned file name
1	Request for extension of time limit during examination procedure	P110079EP-PCT - extension.pdf	EXRE92-1.pdf

Signatures

Place:

Date: **28 August 2014**

Signed by: **Simon Beck 12924**

Capacity: **(Representative)**

Withers & Rogers LLP

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Our Ref: P110079EP-PCT/SAB/TB

Your Ref:

European Patent Office
D-80298
München
Germany

28 August 2014

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

European Patent Application No. 06814053.2 based on PCT/US2006/034184
Dynamic Speech Sharpening
VoiceBox Technologies, Inc

We hereby request an extension of two months to the period for responding to the examination report issued on 26 May 2014 such that a response falls due by 26 November 2014.

Yours faithfully

Simon A Beck
Authorised Representative
WITHERS & ROGERS LLP

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Electric Works, Sheffield Digital Campus, Sheffield, S1 2BJ Tel: +44 (0)114 273 3400 Fax: +44 (0)114 275 5788 and
Steinerstr. 15, building A, D-81369 Munich, Germany Tel: +49 (0)89 50222 402800

R1 2014

The examination is being carried out on the **following application documents**

Description, Pages

1-16 as published

Claims, Numbers

1-15 filed in electronic form on 12-04-2011

Drawings, Sheets

1/3-3/3 as published

1 Despite the references to the description as originally filed mentioned by the applicant in the sections "Clarity" and "Novelty" of the letter of reply provided in electronic form on 12.04.2011, no basis can be identified in the application documents as originally filed - i.e. in the application as published - for the combinations of features claimed by present amended **claims 1-15**.

Specifically, no embodiments can be found in the description as originally filed which would seem to disclose a "system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterance" comprising any of the specific combinations of features as claimed in any of claims 1-8, a "method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances" comprising any of the specific combinations of features as claimed in any of claims 9-11, and a "method for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances" comprising any of the specific combinations of features as claimed in any of claims 12-15.

Therefore, the applicant is invited to provide said missing basis as evidence for the compliance of the present application with the requirements of **Article 123(2) EPC**.

2 In assessing novelty (Article 54(1) and (2) EPC) and inventive step (Article 56 EPC) of the claimed subject-matter, the applicant argues that "D1 does not disclose using both phoneme and syllable recognition" (see applicant's letter filed in electronic form on 12.04.2011, e.g. page 3, last paragraph). However, it is noted that the quantity "*P*" comprised in the syllable-based recognizer according to equation (5) on page 1258 of D1 represents a scored phonetic

graph (see D1, page 1258, left-hand column, section 2, line below equation (1)), the nodes of which are generally represented by hypothesized (i.e. recognized) phonemes. Therefore, "*P'* is considered as representing the claimed "recognized phoneme stream".

Consequently, notwithstanding the lack of basis mentioned above in section 1, the objections raised in sections 3-6 of the European search opinion accordingly apply, mutatis mutandis, to present claims 1-15, the respective subject-matter of which thus is not new in the sense of **Article 54(1) and (2) EPC (claims 1, 12)** or does not involve an inventive step within the meaning **of Article 56 EPC (claims 2-11 and 13-15)**.

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Substantive Examiner
Name: Tilp, Ján
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Application No.	Ref.	Date
06 814 053.2 - 1910	P110079EP/SAB	26.05.2014
Applicant: Voicebox Technologies, Inc.		

Communication pursuant to Article 94(3) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(2) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 4 months

from the notification of this communication, this period being computed in accordance with Rules 126(2) and 131(2) and (4) EPC. One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (R. 50(1) EPC).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Art. 94(4) EPC).

Registered letter
EPO Form 2001 12.10CSX

Tilp, Jan
Primary Examiner
For the Examining Division

Enclosure(s): 2 page/s reasons (Form 2906)

Application No.: 06814053.2

Substantive examination has started on 19.05.14 (see Notice from the European Patent Office dated 29.01.2013, OJ EPO 2013, 153).

For the Examining Division

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	2756936
Application number	EP06814053.2
Date of receipt	12 May 2014
Receiving Office	European Patent Office, The Hague
Your reference	P110079EP/SAB
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) ep-sfd-request.xml ENQUIRY-1.pdf\Letter.pdf (1 p.)
Submitted by	CN=Simon Beck 12924
Method of submission	Online
Date and time receipt generated	12 May 2014, 17:18 (CEST)
Message Digest	89:CC:BD:71:94:08:51:AD:31:B5:39:99:DF:D4:0C:4B:55:B2:2B:F2

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Withers & Rogers LLP

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Our Ref: P110079EP-PCT/SAB

Your Ref:

European Patent Office
D-80298
München
Germany

12 May 2014

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2 BASED ON PCT/US2006/034184
DYNAMIC SPEECH SHARPENING
VOICEBOX TECHNOLOGIES, INC

We note that amended claims were filed in April 2011. We should be grateful if an Officer of the European Patent Office could update us as to when the first substantive Examination Report might be issued.

The 8th year annuity has already been paid in respect of this application, so it would be nice if the first Examination Report could be issued shortly.

Yours faithfully

S A Beck
WITHERS & ROGERS LLP

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R6 2012

Europäisches Patentamt
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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP/SAB

	Description of document	Original file name	Assigned file name
1	General enquiry	Letter.pdf	ENQUIRY-1.pdf

Signatures

Place:

Date: **12 May 2014**

Signed by: **Simon Beck 12924**

Capacity: **(Representative)**

Europäisches Patentamt
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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	2082244	
Application number	EP06814053.2	
Date of receipt	11 April 2013	
Receiving Office	European Patent Office, The Hague	
Your reference	P110079EP-PCT	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (1 p.)	ep-sfd-request.xml ENQUIRY-1.pdf\P110079EP-PCT - status.pdf (1 p.)
Submitted by	CN=S. Beck 12924,O=Withers & Rogers LLP,C=GB	
Method of submission	Online	
Date and time receipt generated	11 April 2013, 14:41 (CEST)	
Message Digest	BB:CC:BA:31:E4:92:17:4D:FA:9E:E3:A6:1C:A5:BF:CC:DF:CD:39:31	

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/European Patent Office/

Withers & Rogers LLP

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Our Ref: P110079EP-PCT/SAB/TB

Your Ref:

European Patent Office
D-80298
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11 April 2013

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

European Patent Application No. 06814053.2 based on PCT/US2006/034184
Dynamic Speech Sharpening
VoiceBox Technologies, Inc

We note that approximately two years have passed since we filed a response to the extended European search report. We should be grateful if an officer of the EPO could indicate when we might expect to receive the first examination report.

Yours faithfully

S A Beck
Authorised Representative
WITHERS & ROGERS LLP

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R6 2012

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP-PCT

	Description of document	Original file name	Assigned file name
1	General enquiry	P110079EP-PCT - status.pdf	ENQUIRY-1.pdf

Signatures

Place:

Date: **11 April 2013**

Signed by: **GB, Withers & Rogers LLP, S. Beck 12924**

Capacity: **(Representative)**

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EPO - Munich
39
10. Sep. 2011

Client Data Registration
European Patent Office
82098
Munich
Germany

Our Ref: RRB
Your Ref:
31 August 2011

Dear Sir/Madam

Change of address for our registered office

From Monday 12 September the address of the London office of Withers & Rogers Group LLP, Withers & Rogers LLP and Withers & Rogers Renewals LLP will change to :

4 More London Riverside
London
SE1 2AU
UK

Tel: 020 7940 3600
Fax: 020 7378 9680

Please update your records from 12 September.

Thank you.

Yours faithfully

Richard Bunn
Practice Director
WITHERS & ROGERS GROUP LLP

Withers & Rogers Group LLP is a limited liability partnership registered in England and Wales (registered number OC310991), with its principal place of business and registered office at Goldings House, 2 Hays Lane, London SE1 2HW.

Europäisches Patentamt
European Patent Office
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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	1163704
Application number	EP06814053.2
Date of receipt	12 April 2011
Receiving Office	European Patent Office, The Hague
Your reference	P110079EP/SAB
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) CLMSPAMD-1.pdf\ReplacementClaims.pdf (5 p.) ep-sfd-request.xml EPLETT-1.pdf\Letter.pdf (5 p.) CLMSPAMD-2.pdf\MarkUp_AmendedClaims.pdf (8 p.)
Submitted by	CN=S. Beck 12924,O=Withers & Rogers LLP,C=GB
Method of submission	Online
Date and time receipt generated	12 April 2011, 15:56 (CEST)
Message Digest	93:D6:80:BF:48:C8:77:66:15:EC:73:B2:33:CC:4B:45:87:C1:2D:E1

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

CLAIMS

1. A system for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

an audio capture device configured to receive a natural language utterance and generate an electronic signal corresponding to the natural language utterance; and

a speech interpretation engine coupled to the audio capture device and configured to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

characterised in that the speech interpretation engine is further reconfigured to map the recognized phoneme stream to one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine; and

generate a preliminary interpretation of the natural language utterance, wherein the generated preliminary interpretation includes the one or more syllables mapped to the recognized phoneme stream.

2. The system of claim 1, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

3. The system of claim 2, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

4. The system of claim 3, wherein the acoustic grammar includes an unstressed central vowel linking element between the constrained transitions to reduce a search space associated with the speech interpretation engine.

5. The system of claim 4, wherein the unstressed central vowel comprises a *schwa* acoustic element.

6. The system of claim 1, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

7. The system of claim 6, wherein to generate the plurality of candidate interpretations, the sharpening engine is further configured to:

identify a plurality of words or phrases in the grammar tree that possibly map to the one or more syllables; and

provide the identified plurality of words or phrases to a plurality of domain agents configured to:

identify one or more suspect words or phrases in the identified plurality of words or phrases, wherein the one or more suspect words or phrases have phonetic similarities to information in domain contexts associated with the plurality of domain agents;

identify one or more closest phonetic matches to the one or more suspect words or phrases using closest-distance metrics associated with M-Tree weighted models in the domain contexts associated with the plurality of domain agents; and

substitute the one or more closest phonetic matches for the one or more suspect words or phrases to generate the plurality of candidate interpretations.

8. The system of claim 7, wherein the sharpening engine is configured to identify the plurality of words or phrases in the grammar tree that possibly map to the one or more syllables using a context associated with the natural language utterance, criteria identified in the natural language utterance, a history of previous natural language utterances, user profile information, or domain specific information.

9. A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances, the method comprising:

phonemically representing one or more acoustic elements in an acoustic language model, wherein the one or more acoustic elements include an unstressed central vowel;

phonemically representing one or more syllables in the acoustic language model, wherein the one or more acoustic elements further include a phoneme loop to phonemically represent the one or more syllables;

constructing an acoustic grammar that constrains transitions between the acoustic elements in the phoneme loop, wherein the acoustic grammar constrains the transitions based on phonotactic rules associated with the acoustic language model; and

using the unstressed central vowel to link the constrained transitions between the acoustic elements in the phoneme loop.

10. The method of claim 9, wherein the one or more acoustic elements includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables.

11. The method of claim 10, the wherein unstressed central vowel comprises a *schwa* acoustic element.

12. A method for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

using an audio capture device configured to receive a natural language utterance to generate an electronic signal corresponding to the natural language utterance; and

using a speech interpretation engine coupled to the audio capture device to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

map the recognized phoneme stream one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine; and

generate a preliminary interpretation of the natural language utterance, wherein the generated preliminary interpretation includes the one or more syllables mapped to the recognized phoneme stream.

13. The method of claim 12, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

14. The method of claim 13, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

15. The method of claim 12, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

CLAIMS

1.A method for providing out-of-vocabulary interpretation capabilities and for tolerating noise when interpreting natural language speech utterances, the method comprising:

receiving an utterance from a user;

recognizing a stream of phonemes contained in the utterance;

mapping the recognized stream of phonemes to an acoustic grammar that phonemically represents one or more syllables, the recognized stream of phonemes mapped to a series of one or more of the phonemically represented syllables; and

generating at least one interpretation of the utterance, wherein the generated interpretation includes the series of syllables mapped to the recognized stream of phonemes.

2.The method of claim 1, the acoustic grammar phonemically representing the one or more syllables in accordance with acoustic elements of an acoustic speech model, wherein each syllable is represented by acoustic elements for an onset, a nucleus, and a coda.

3.The method of claim 2, the acoustic grammar including transitions between the acoustic elements, wherein the transitions are constrained according to phonotactic rules of the acoustic speech model.

4.The method of claim 3, the acoustic elements including at least an unstressed central vowel and a plurality of phonemic elements associated with the acoustic speech model, wherein the acoustic grammar uses the unstressed central vowel as a linking element between sequential phonemic elements.

5.The method of claim 4, the unstressed central vowel including a *schwa* acoustic element.

6.The method of claim 1, further comprising:

generating a plurality of candidate interpretations of the utterance, wherein each candidate interpretation includes a series of words or phrases corresponding to the series of syllables mapped to the recognized stream of phonemes;

assigning a score to each of the plurality of candidate interpretations; and

selecting a candidate interpretation having a highest assigned score as being a probable interpretation of the utterance.

7.The method of claim 6, wherein generating the plurality of candidate interpretations of the utterance includes:

identifying a series of words or phrases possibly corresponding to the series of syllables mapped to the recognized stream of phonemes; and

providing the identified series of words or phrases to a plurality of domain agents, each of the plurality of domain agents generating a candidate interpretation by:

identifying any suspect words or phrases among the identified series of words or phrases;

identifying one or more closest phonetic matches for the identified suspect words or phrases using a closest distance metric associated with an M-Tree; and

substituting the identified closest phonetic matches for the identified suspect words or phrases to generate the candidate interpretation.

8.The method of claim 7, wherein identifying the series of words or phrases possibly corresponding to the series of syllables includes using one or more of a context associated the utterance, criteria identified in the utterance, a history of previous utterances, user profile information, or domain specific information.

~~9.~~1. A system for providing out-of-vocabulary ~~interpretation capabilities~~ and ~~for tolerating~~ noise toleration capabilities to interpret ~~when interpreting~~ natural language ~~speech~~ utterances, ~~the system~~ comprising:

an audio capture ~~at least one input~~ device configured to receive a natural language ~~that receives an~~ utterance ~~from a user~~ and generate ~~generates~~ an electronic signal corresponding to the natural language utterance; and

a speech interpretation engine coupled to ~~that receives~~ the ~~electronic signal corresponding to the utterance, the speech interpretation engine operable~~ audio capture device and configured to:

analyze the generated electronic signal to recognize a phoneme stream ~~of phonemes~~ contained in the natural language utterance;

characterised in that the speech interpretation engine is further reconfigured to map the recognized phoneme stream ~~of phonemes~~ to ~~an acoustic grammar that phonemically represents~~ one or more syllables~~, the recognized stream of phonemes mapped to a series of one or more of the~~ that are phonemically represented ~~syllables~~ in an acoustic grammar associated with the speech interpretation engine; and

generate a preliminary ~~at least one~~ interpretation of the natural language utterance, wherein the generated preliminary interpretation includes the ~~series of~~ one or more syllables mapped to the recognized phoneme stream ~~of phonemes~~.

~~10.~~2. The system of claim ~~9~~1, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically ~~representing~~ represent the one or more syllables ~~in accordance with acoustic elements of~~ based on an acoustic ~~speech~~ language model~~, wherein each syllable is represented by acoustic elements for an onset, a nucleus, and a coda~~.

~~11.~~3. The system of claim ~~10~~2, wherein the acoustic grammar constrains ~~including~~ transitions between the onset, nucleus, and coda acoustic elements~~, wherein the~~

~~transitions are constrained according~~ to phonemically represent the one or more syllables based on phonotactic rules ~~of~~ associated with the acoustic ~~speech~~ language model.

~~12.~~4. The system of claim ~~11~~3, wherein the acoustic grammar includes ~~elements including at least~~ an unstressed central vowel ~~and a plurality of phonemic elements associated with the acoustic speech model, wherein the acoustic grammar uses the unstressed central vowel as a~~ linking element between ~~sequential phonemic elements~~ the constrained transitions to reduce a search space associated with the speech interpretation engine.

~~13.~~5. The system of claim ~~12~~4, wherein the unstressed central vowel comprises ~~including~~ a *schwa* acoustic element.

~~14.~~6. The system of claim ~~9~~1, further comprising a sharpening engine coupled to ~~that receives the generated interpretation of the utterance from~~ the speech interpretation engine~~, the sharpening engine operable~~ and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein ~~each~~ the plurality of candidate interpretations include ~~interpretation includes a series of~~ one or more words or phrases that map ~~corresponding~~ to the ~~series of~~ one or more syllables in a grammar tree associated with ~~mapped to~~ the ~~recognized stream of phonemes~~ acoustic grammar; and

~~assign a score to each of the plurality of candidate interpretations; and~~

generate ~~select~~ a probable ~~candidate~~ interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence ~~assigned~~ score ~~as being a probable interpretation of the utterance~~.

~~15.~~7. The system of claim ~~14~~6, wherein ~~the sharpening engine operable~~ to generate the plurality of candidate interpretations, ~~of~~ the ~~utterance by~~ sharpening engine is further configured to:

identify a plurality ~~identifying a series~~ of words or phrases in the grammar tree that possibly map ~~corresponding~~ to the ~~series of~~ one or more syllables ~~mapped to the recognized stream of phonemes~~; and

provide ~~providing~~ the identified ~~series~~ plurality of words or phrases to a ~~plurality of domain agents, each of the~~ plurality of domain agents ~~generating a candidate interpretation by~~ configured to:

identify one or more ~~identifying any~~ suspect words or phrases ~~among~~ in the identified plurality ~~series~~ of words or phrases, wherein the one or more suspect words or phrases have phonetic similarities to information in domain contexts associated with the plurality of domain agents;

identify ~~identifying~~ one or more closest phonetic matches ~~for~~ to the one or more ~~identified~~ suspect words or phrases using ~~a~~ closest-distance metrics ~~metric~~ associated with ~~an~~ M-Tree weighted models in the domain contexts associated with the plurality of domain agents; and

substitute ~~substituting~~ the ~~identified~~ one or more closest phonetic matches for the ~~identified~~ one or more suspect words or phrases to generate the plurality of candidate ~~interpretation~~ interpretations.

~~16.~~8. The system of claim ~~15~~7, wherein the sharpening engine is configured ~~operable~~ to identify the plurality ~~series~~ of words or phrases in the grammar tree that possibly map ~~corresponding~~ to the ~~series of~~ one or more syllables using ~~one or more of~~ a context associated with the natural language utterance, criteria identified in the natural language utterance, a history of previous natural language utterances, user profile information, or domain specific information.

~~17.~~9. A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances, the method comprising:

phonemically representing one or more ~~creating a phonemic representation of~~ acoustic elements ~~associated with~~ in an acoustic ~~speech~~ language model, wherein the one or more acoustic elements include ~~including at least~~ an unstressed central vowel ~~and plurality of phonemic elements~~;

phonemically representing one or more syllables in ~~associated with~~ the acoustic ~~speech~~ language model ~~using the phonemic representation~~, wherein ~~each of~~ the ~~represented syllables including~~ one or more acoustic elements further include a ~~series of acoustic elements~~ phoneme loop to phonemically represent the one or more syllables;

constructing an acoustic grammar that ~~contains~~ constrains transitions between the acoustic elements in ~~of~~ the ~~represented syllables~~ phoneme loop, wherein the acoustic grammar constrains the transitions based on ~~constrained according to~~ phonotactic rules ~~of~~ associated with the acoustic ~~speech~~ language model; and

using the unstressed central vowel to link the constrained transitions ~~as a linking element~~ between ~~sequential phonemic elements contained in~~ the ~~constructed~~ acoustic ~~grammar~~ elements in the phoneme loop.

~~18.~~10. The method of claim ~~17~~9, wherein the one or more ~~series of~~ acoustic elements ~~defining an~~ includes onset, ~~a~~ nucleus, and ~~a~~ coda acoustic elements to phonemically represent ~~for a given one of~~ the ~~represented~~ one or more syllables.

~~19.~~11. The method of claim ~~18~~10, the wherein unstressed central vowel comprises ~~including~~ a *schwa* acoustic element.

12. A method for providing out-of-vocabulary and noise toleration capabilities to interpret natural language utterances, comprising:

using an audio capture device configured to receive a natural language utterance to generate an electronic signal corresponding to the natural language utterance; and

using a speech interpretation engine coupled to the audio capture device to:

analyze the generated electronic signal to recognize a phoneme stream contained in the natural language utterance;

map the recognized phoneme stream one or more syllables that are phonemically represented in an acoustic grammar associated with the speech interpretation engine; and

generate a preliminary interpretation of the natural language utterance, wherein the generated preliminary interpretation includes the one or more syllables mapped to the recognized phoneme stream.

13. The method of claim 12, wherein the acoustic grammar includes onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on an acoustic language model.

14. The method of claim 13, wherein the acoustic grammar constrains transitions between the onset, nucleus, and coda acoustic elements to phonemically represent the one or more syllables based on phonotactic rules associated with the acoustic language model.

15. The method of claim 12, further comprising a sharpening engine coupled to the speech interpretation engine and configured to:

generate a plurality of candidate interpretations of the natural language utterance, wherein the plurality of candidate interpretations include one or more words or phrases that map to the one or more syllables in a grammar tree associated with the acoustic grammar; and

generate a probable interpretation of the natural language utterance, wherein the probable interpretation comprises one of the plurality of candidate interpretations having a highest confidence score.

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11 April 2011

SIGNED AND SENT ELECTRONICALLY

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Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2 BASED ON PCT/US2006/034184
DYNAMIC SPEECH SHARPENING
VOICEBOX TECHNOLOGIES, INC

In response to the extended European search report in respect of the above application, we hereby file amended pages to be substituted in place of the corresponding pages currently on file. We also confirm that Examination is to be continued with.

Clarity

With regard to Section 2.1 of the report, claim 9 renumbered as claim 1 and has been amended so as to better define the apparatus in terms of its technical features. The input device at line 4 of the claim has been more specifically defined as *"an audio capture device"*. Furthermore the same phrase has been amended to clarify that the utterance is a *"natural language utterance"*. The relationship between the audio capture device and the speech interpretation engine has also been clarified, the corresponding phrase now stating *"a speech interpretation engine coupled to the audio capture device [...]"*. Support for these amendments can be found at least at paragraph 39, lines 3-7 of the application as filed which states *"The received user verbalization* (natural language utterance) *may be electronically captured at operation 312, such as by a microphone or other electronic audio capture device. The electronically captured verbalization may be provided to a speech interpretation engine [...]"*.

Claim 14 (now claim 6) has been amended to address the Examiner's objections at section 2.1 of the search report. The phrase *"that receives the generated interpretation of the utterance from"* has been replaced with the phrase *"coupled to"* so as to better define the sharpening engine in terms of it's technical features. The sentence now reads *"a sharpening engine coupled to the speech interpretation engine, and configured to:"*. Support for these amendments can be found at least on page 14, paragraph [040], lines 1-2 which reads *"The speech interpretation may then generate one or*

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R4 2010

more preliminary interpretations", and paragraph [041], lines 1-2 which read *"[...] the preliminary interpretations may be provided to a speech sharpening engine."*

Further amendments to claim 14 and 16 include the addition of the term *"natural language utterance"* as now used in claim 9, and the feature of the *grammar tree* has been added to claims 14-16, support for which can be found at least on page 14, paragraph [040], and in particular lines 2-3 which state *"preliminary interpretations may be generated using phonetic dictation, grammar trees with linking elements [...]"*.

As regards Section 2.2 of the report, the Examiner has suggested that the phrase "wherein the preliminary interpretation includes the series of one or more syllables mapped to the recognised stream of phonemes" is not supported by the description.

Paragraph 9 of the application as published teaches that phoneme recognition may be based on any suitable acoustic grammar that maps a speech signal to a phonemic representation. It then discusses the case of the English language (as does the example in the description of an exemplary embodiment, see brief description of the Figures for confirmation that only an example of the invention is given) where portions of a word may be represented as a syllable. This gives a person skilled in the art a clear direction that use of other mapping to phonemes could occur.

Whilst it is difficult for European speakers to imagine languages not composed solely of syllables, it transpires that some of the native North American languages challenge the notions of the syllable. Indeed, even in English there are recognised utterances that have no vowels and arguably are not represented by syllables. Examples are "shh" meaning quiet, and "psst" to attract attention.

It is therefore respectfully submitted that this part of the claim is supported by the description as filed, and the exemplary embodiment which relates to only a single language should not be used to enforce a narrowing of this feature in claim 1. This part of claim 1 has been amended to recite that the interpretation is a preliminary interpretation. Support for this is found at several places throughout the specification as published, but a specific instance is to be found at paragraph 31, first two sentences thereof.

To attend to the objection at section 2.3 of the search report, the term *"suspect words or phrases"* has been defined more clearly in claim 15, now renumbered as claim 7, with the addition of the phrase *"wherein the one or more suspect words or phrases have phonetic similarities to information in domain contexts associated with the plurality of domain agents"*. Basis can be found for this amendment throughout the description, and in particular in paragraph 36, lines 5-6 which relates to the identification of *"[...] suspect words and/or phrases based on phonetic similarities and/or domain appropriateness"*.

It is now considered that all objections with regard to clarity have been attended to. Notwithstanding, in order to improve their readability, the wording of some of the claims has been amended. These amendments are explained as follows.

Claim 10, now renumbered as claim 2, has been rearranged so as to better it's legibility. The subject matter however remains the same.

Claim 11, now renumbered as claim 3, has been amended to better conform to the format of preceding claims. This claim now specifically identifies the acoustic elements as *"onset, nucleus, and coda acoustic elements"*. Support for this amendment can be found in the application as filed at least on page 8. paragraph [024], lines 9-10 which states that *"[...] words may be divided into syllables, which may be further broken down into core components of an onset, a nucleus, and a coda [...]"*. The phrase *"wherein the transitions are constrained according to phonotactic rules"* has been replaced with the phrase *"to phonemically represent the one or more syllables based on phonotactic rules"* which corresponds more clearly to the wording of claim 2 (previously claim 10).

Claim 12 has been renumbered as claim 4 and amended to clarify it's meaning. The claim now reads *"The system of claim 3, wherein the acoustic grammar includes an unstressed vowel linking element between the constrained transitions to reduce a search space associated with the speech interpretation engine."*. Support for this can be found for instance in original claim 12, and on page 10, paragraph [030], lines 6-10 which state *"The linking element may be an acoustic element that is likely to be triggered even if unpronounced. For example [...] an unstressed, central vowel in the English language [..and..] this approach may be extended to acoustic models of speech signals for other languages by using frequently elided phonemes as linking element to reduce search space of an acoustic grammar"*.

In claim 4 (previously 13) and claim 11 (previously claim 19), the word *"wherein"* has been added and the word *"including"* has been replaced by the word *"comprises"* so as to better conform with the description.

Claim 9 (previously claim 17) has been amended with the replacement of the phrase *"creating a phonemic representation of"* with the phrase *"phonemically representing one or more"* to improve the readability of the claim.

Instances of the word *"series"* throughout the claim set has been replaced with the word *"plurality"*.

Novelty

In order to address the novelty objection raised at section 3 of the report, claim 9 (now claim 1) has been amended to substitute the phrase *"recognize a stream of phonemes constrained in the utterance"* for *"analyze the generated electronic signal to recognize a phoneme stream constrained in the natural language utterance"*. Support for the analysis of the generated electronic signal by the speech interpretation engine may found in paragraph 39, lines 5-7 which state *"The electronically captured verbalization may be provided to a speech interpretation engine"* and paragraph 40, lines 1-2 which state *"The speech interpretation may then generate one or more preliminary interpretations of the received verbalizations [...]"*.

It is submitted that amended claim 1 is novel with respect to D1. It is our understanding that D1 does not disclose limitation of claim 1. Assuming that the words phone and phoneme in this context are equivalent, D1 does not disclose using both phoneme and syllable recognition in the first (preliminary) stage of interpretation. The abstract of D1 states that the paper *"explores the use of the phone and syllable as primary units of representation in the first stage of a two-stage recognizer"*. However, D1, section 2, lines 19-20 state that the recognizer architecture is composed of two stages *"using either phones or syllables as the first-stage unit of representation."* The paper then goes on to describe in section 2.1 *"A two-stage search using phones as the first-stage unit of representation"*

and in section 2.2 *"A two-stage search using syllables as the first-stage unit of representation"*. Using *"the phone recogniser"* method, D1 describes computing a phone graph during the first recognition stage and then composing this graph with the word finite-state transducer (FST) to produce the best word hypothesis (*See* page 1258, right-hand column, lines 15-17). Using *"the syllable recognizer"* method, the first-stage comprises computing a syllable graph followed by again composing this graph with a word FST to produce a best word hypothesis (*See* page 1258, right-hand column, lines 45-48). In contrast, claim 9 of the present application states that the first stage of interpretation comprises recognizing a phoneme stream, mapping this phoneme stream to one or more syllables that are phonemically represented in an acoustic grammar, these syllables forming the preliminary interpretation. D1 does not teach the initial step of recognising and mapping the phonemes to syllables and accordingly, claim 9 is novel over D1.

Inventive Step

As noted above, D1 fails to teach an arrangement in which a phoneme stream is mapped to one or more syllables that are phonemically represented in an acoustic grammar or generating a preliminary interpretation that includes one or more syllables mapped to a phoneme stream.

Such an arrangement allows for an improved performance in identifying out of vocabulary words, and reduces the size of the grammar needed.

D1, if anything, teaches the person skilled in the art away from adopting the claimed solution. The teachings of D2, D3 or D4 do not seem to point the skilled person towards the claimed solution.

D2 seems to suggest analysing the audio input to remove non-verbal sounds or to identify the location of speech before attempting speech to text conversion.

D3 seems to suggest making a phonemic decomposition of the input speech, but there is no linkage to syllables.

D4 seems to suggest matching to phonemes, but seemingly fails to suggest generating a preliminary interpretation consisting of one or more syllables mapped to the phoneme stream.

Thus none of the documents either alone or in combination would motivate the person skilled in the art to arrive at the claimed invention.

Previous claim 17, now claim 8, has been amended so as to conform more closely to independent claim 1. Reference to the feature of the phoneme loop has been added to the claim. The phrase *"each of the represented syllables including a series of acoustic elements"* has been replaced by the phrase *"the one or more acoustic elements further include a phoneme loop to phonemically represent the one or more syllables"*. Support for this amendment can be found on page 8, paragraph 025, lines 3-5 which state *"The acoustic grammar may include a loop of phonemes, or the phoneme loop may include a linking element to reduce a size of a search space associated with the grammar"*. The remainder of the claim has been reworded where applicable in order to better clarify it's meaning. Since method claim 9 now includes the limitations of the corresponding apparatus claim 1, we consider claim 17 to be both novel and inventive over the prior art for identical reasons that have been argued in support of claim 1.

It is believed that this has addressed the Examiner's objections.

Yours faithfully

S A Beck
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Enc. Replacement claims
Mark-up amended claims

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP/SAB

	Description of document	Original file name	Assigned file name
1	Letter relating to the search and examination procedure	Letter.pdf	EPLETT-1.pdf
2	Amended claims	ReplacementClaims.pdf	CLMSPAMD-1.pdf
3	Amended claims	MarkUp_AmendedClaims.pdf	CLMSPAMD-2.pdf

Signatures

Place:	
Date:	**12 April 2011**
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Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 2225 / 1934971 PCT/US2006034184
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication pursuant to Rules 70(2) and 70a(2) EPC

A supplementary European search report has been drawn up concerning the above-identified European patent application (publication number: 1934971).

Since the request for examination has been filed (R. 70(1), 159(1)(f), Art. 94(1) EPC) prior to the transmission of the supplementary European search report, you are hereby invited to indicate within

six months

of notification of this communication whether you wish to proceed further with the European patent application.

If you do not indicate in due time that you wish to proceed further with the European patent application, it **will be deemed to be withdrawn** (R. 70(3) EPC).

You are invited to correct any deficiencies noted in the opinion accompanying the European search report and to amend the description, claims and drawings within the above period (R. 70a(2), R. 137(2) EPC).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Should the reply to the invitation pursuant to Rule 70a(2) EPC be filed in an admissible non-EPO language, a translation is to be submitted within one month of its filing (R. 6(2) EPC).

Should you not comply with or comment on this invitation within the time limit, the application **will be deemed to be withdrawn** in accordance with Rule 70a(3) EPC.

Receiving Section

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Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 2225 / 1934971 PCT/US2006034184
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the supplementary European search report (Art. 153(7) EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

☑ 1 additional set(s) of copies of such documents is (are) enclosed as well.

Refund of the search fee

If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

The examination is being carried out on the **following application documents**

Description, Pages

1-16 as published

Claims, Numbers

9-19 received on 14-05-2008 with letter of 14-05-2008

Drawings, Sheets

1/3-3/3 as published

1 Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure:

D1 BAZZI I ET AL: "Heterogeneous lexical units for automatic speech recognition: preliminary investigations"ACOUSTICS, SPEECH, AND SIGNAL PROCESSING, 2000. ICASSP '00. PROCEEDING S. 2000 IEEE INTERNATIONAL CONFERENCE ON 5-9 JUNE 2000, PISCATAWAY, NJ, USA,IEEE, vol. 3, 5 June 2000 (2000-06-05) , pages 1257-1260, XP010507574ISBN: 978-0-7803-6293-2

D2 US 6 470 315 B1 (NETSCH LORIN PAUL [US] ET AL) 22 October 2002 (2002-10-22)

D3 US 2004/193408 A1 (HUNT MELVYN J [GB]) 30 September 2004 (2004-09-30)

D4 O'SHAUGHNESSY D: "Interacting with computers by voice: automatic speech recognition and synthesis"PROCEEDINGS OF THE IEEE, IEEE. NEW YORK, US LNKD- DOI:10.1109/JPROC.2003.817117, vol. 91, no. 9, 1 September 2003 (2003-09-01) , pages 1272-1305, XP011100665ISSN: 0018-9219

2 The application does not meet the requirements of Article 84 EPC, because certain claims are not clear.

2.1 Some of the features in the apparatus **claims 9 and 14** (e.g. "at least one input device that receives an utterance from a user and generates [...]" in claim 1, line 4, and "a sharpening engine that receives [...]" in claim 14, line 1) relate to methods of using the apparatus rather than clearly defining the apparatus in terms of their technical features. The intended limitations are therefore not clear from these claims, contrary to the requirements of Article 84 EPC.

2.2 **Claim 9** is not supported by the description as required by Article 84 EPC, as its scope is broader than justified by the description and drawings. Particularly, claiming that "the generated interpretation includes the series of syllables mapped to the recognized stream of phonemes" appears as a generalization of what is disclosed in the description (see e.g. paragraph [0025]), where said interpretation is defined to consist of the series of syllables mapped to the recognized stream of phonemes.

2.3 The term "suspect words or phrases" used in **claim 15** is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Article 84 EPC).

3 Furthermore, notwithstanding the above-mentioned lack of clarity, the subject-matter of independent **claim 9** is not new within the meaning of Article 54(1) and (2) EPC, and the requirements of Article 52(1) EPC are therefore not met.

D1 discloses (the references in parentheses applying to this document) - applying the wording of claim 9:

"A system for providing out-of-vocabulary interpretation capabilities and for tolerating noise when interpreting natural language speech utterances (page 1258, left-hand column, lines 9-11 as well as page 1257, right-hand column, lines 11-19 and 35-37), the system comprising:

at least one input device that receives an utterance from a user and generates an electronic signal corresponding to the utterance (generally implicit to claimed type of system); and

a speech interpretation engine that receives the electronic signal corresponding to the utterance (generally implicit to claimed type of system), the speech interpretation engine operable to:

recognize a stream of phonemes contained in the utterance (page 1258, right-hand column, section 2.2, lines 21-29, wherein P represents said stream of phonemes);

map the recognized stream of phonemes to an acoustic grammar that phonemically represents one or more syllables, the recognized stream of phonemes mapped to a series of one or more of the phonemically represented syllables (page 1258, right-hand column, section 2.2, lines 21-29, wherein G_s represents said syllable grammar); and

generate at least one interpretation of the utterance, wherein the generated interpretation includes the series of syllables mapped to the recognized stream of phonemes (page 1258, right-hand column, equation (5))."

The subject-matter of claim 9 is therefore not new (Article 54(1) and (2) EPC).

4 Dependent **claims 10-16** do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step (Article 56 EPC), the reasons therefor being as follows:

4.1 In light of D2, paragraphs [0023] and [0024], it would be obvious to the person skilled in the art to apply the features additionally claimed by **claims 10-13**.

4.2 The features additionally claimed by **claims 14-16** have often been applied before (see also documents D3 and D4 and the corresponding references cited in the European Search Report), and each of them represents merely one of several straightforward possibilities which the skilled person would select, depending on the circumstances, without exercising inventive skill.

5 The combination of features claimed by independent **claim 17** essentially corresponds to those features additionally claimed in claim 12, claim 9 (lines 9-10), claim 10 (generalized) and claim 11. Therefore, the subject-matter of claim 17 does not involve an inventive step within the meaning of Article 56 EPC.

6 The features additionally claimed by **claims 18 and 19** correspond to features claimed by claims 10 and 13. The objections raised against said latter claims therefore also apply, mutatis mutandis, to claims 18 and 19, which thus fail to fulfill the requirements of the EPC with respect to an inventive step (Article 56 EPC).

7 It is not at present apparent which part of the application could serve as a basis for a new, allowable claim. Should the applicant nevertheless regard some particular matter as patentable, an independent claim should be filed taking account of Rule 43(1) EPC. The applicant should also indicate how the subject-matter of the new claim differs from the state of the art and the significance thereof.

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SUPPLEMENTARY EUROPEAN SEARCH REPORT

Application Number
EP 06 81 4053

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	BAZZI I ET AL: "Heterogeneous lexical units for automatic speech recognition: preliminary investigations" ACOUSTICS, SPEECH, AND SIGNAL PROCESSING, 2000. ICASSP '00. PROCEEDING S. 2000 IEEE INTERNATIONAL CONFERENCE ON 5-9 JUNE 2000, PISCATAWAY, NJ, USA,IEEE, vol. 3, 5 June 2000 (2000-06-05), pages 1257-1260, XP010507574 ISBN: 978-0-7803-6293-2	9,14-16	INV. G10L15/18
Y	* page 1257, right-hand column, lines 11-19 * * page 1257, right-hand column, lines 35-37 * * page 1258, left-hand column, lines 9-11 * * page 1258, right-hand column, lines 21-29 * * page 1258, right-hand column, equation (5) *	10-13, 17-19	
Y	US 6 470 315 B1 (NETSCH LORIN PAUL [US] ET AL) 22 October 2002 (2002-10-22) * paragraphs [0024], [0025] *	10-13, 17-19	TECHNICAL FIELDS SEARCHED (IPC) G10L
A	US 2004/193408 A1 (HUNT MELVYN J [GB]) 30 September 2004 (2004-09-30) * paragraphs [0011], [0048], [0049] *	14-16	

-/--

The supplementary search report has been based on the last set of claims valid and available at the start of the search.

Place of search	Date of completion of the search	Examiner
Munich	21 September 2010	Tilp, Jan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C04)

Europäisches Patentamt
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Office européen des brevets

SUPPLEMENTARY EUROPEAN SEARCH REPORT

Application Number
EP 06 81 4053

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	O'SHAUGHNESSY D: "Interacting with computers by voice: automatic speech recognition and synthesis" PROCEEDINGS OF THE IEEE, IEEE. NEW YORK, US LNKD- DOI:10.1109/JPROC.2003.817117, vol. 91, no. 9, 1 September 2003 (2003-09-01), pages 1272-1305, XP011100665 ISSN: 0018-9219 * section III.E-4 * * sections III.F-H * -----	14-16	
			TECHNICAL FIELDS SEARCHED (IPC)

The supplementary search report has been based on the last set of claims valid and available at the start of the search.

Place of search	Date of completion of the search	Examiner
Munich	21 September 2010	Tilp, Jan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

3

EPO FORM 1503 03.82 (P04C04)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 81 4053

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-09-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6470315 B1	22-10-2002	NONE	
US 2004193408 A1	30-09-2004	AT 405919 T	15-09-2008
		EP 1629464 A2	01-03-2006
		JP 2006522370 T	28-09-2006
		KR 20060052663 A	19-05-2006
		WO 2004090866 A2	21-10-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

Europäisches Patentamt
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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	874036	
Application number	EP06814053.2	
Date of receipt	09 July 2010	
Receiving Office	European Patent Office, The Hague	
Your reference	P110079EP/SAB	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (1 p.)	ep-sfd-request.xml EPLETT-1.pdf\Letter.pdf (1 p.)
Submitted by	CN=S. Beck 12924,O=Withers & Rogers LLP,C=GB	
Method of submission	Online	
Date and time receipt generated	09 July 2010, 14:16 (CEST)	
Message Digest	90:59:BC:17:EB:FE:AD:D3:E5:E3:68:84:19:CA:4F:85:5C:2E:76:B6	

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP/SAB

	Description of document	Original file name	Assigned file name
1	Letter relating to the search and examination procedure	Letter.pdf	EPLETT-1.pdf

Signatures

Place:	
Date:	**09 July 2010**
Signed by:	**GB, Withers & Rogers LLP, S. Beck 12924**
Capacity:	**(Representative)**

Withers & Rogers LLP

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TRADE MARK ATTORNEYS

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European Patent Office
D-80298
München
Germany

Our Ref: P110079EP-PCT/SAB

Your Ref:

9 July 2010

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2
BASED ON PCT/US2006/034184
DYNAMIC SPEECH SHARPENING
VOICEBOX TECHNOLOGIES, INC

Further to the communication issued on 12th May 2010 under Rule 62a(1) EPC, we herewith indicate that the search should be carried out in respect of apparatus claims 9 to 16 and method claims 17 to 19.

Yours faithfully

S A Beck
WITHERS & ROGERS LLP

Withers & Rogers LLP is a limited liability partnership registered in England and Wales (registered number OC310992) with its principal place of business and registered office at Goldings House, 2 Hays Lane, London, SE1 2HW. Regulated by IPReg.

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SE1 2HW
ROYAUME-UNI

Application No.	Ref.	Date
06 814 053.2 - 2225	P110079EP/SAB	12.05.2010
Applicant: Voicebox Technologies, Inc.		

Invitation pursuant to Rule 62a(1) EPC

In the above-mentioned European patent application as filed, the search division has identified multiple independent claims in the same category. In accordance with Rule 62a(1) EPC, the applicant is invited to indicate the claims complying with Rule 43(2) EPC on the basis of which the search is to be carried out.

The following groups of independent claims in the same category have been identified:

Category method Independent claims 1, 17

You are invited to file the required indication within a period of

two months

from the notification of this communication.

If the indication is filed in due time, the subsequent search report will be issued with respect to the relevant claim / claims in the category concerned.

Failure to comply with this invitation in due time will result in the search report being drawn up on the basis of the first independent claim in each category (R. 62a(1) EPC). Should the applicant contest the objection under Rule 62a EPC, a final decision on the matter may be taken in the course of substantive examination proceedings before the Examining Division.

Re-establishment of rights (Art. 122 EPC)

An applicant who, in spite of all due care required by the circumstances having been taken, was unable to observe a time limit, shall have his rights re-established upon request, provided that the time limits and other requirements of Rule 136(1) and (2) EPC are met.

Registered Letter
EPO Form 1056a 04.2010CSX

Search Examiner

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	800495	
Application number	EP06814053.2	
Date of receipt	14 April 2010	
Receiving Office	European Patent Office, The Hague	
Your reference	P110079EP-PCT	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (1 p.)	ep-sfd-request.xml ENQUIRY-1.pdf\epo letter.pdf (1 p.)
Submitted by	CN=S. Beck 12924,O=Withers & Rogers LLP,C=UK	
Method of submission	Online	
Date and time receipt generated	14 April 2010, 17:12 (CEST)	
Message Digest	9F:3A:51:1B:81:29:BE:D2:AE:4C:C9:59:26:B9:37:CC:B3:D0:3C:4B	

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Withers & Rogers LLP

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Our Ref: P110079EP-PCT/SAB

Your Ref:

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Netherlands

14 April 2010

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

European Patent Application No. 06814053.2
based on PCT/US2006/034184
Dynamic Speech Sharpening
VoiceBox Technologies, Inc

We note we entered the European regional phase for the above application around two years ago. As yet we have not received a substantive communication from the EPO. We should be grateful if an Officer of the EPO could indicate when we may expect to receive the supplementary European Search Report.

Yours faithfully

S A Beck
WITHERS & ROGERS LLP

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Nicholas Wilson House, Dormer Place, Leamington Spa, Warwickshire, CV32 5AE Tel: +44 (0)1926 310700 Fax: +44 (0)1926 335519 and
Electric Works, Sheffield Digital Campus, Sheffield S1 2BJ Tel: +44 (0)114 286 6262 Fax: +44 (0)114 286 6266

R3 2010

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP-PCT

	Description of document	Original file name	Assigned file name
1	General enquiry	epo letter.pdf	ENQUIRY-1.pdf

Signatures

Place:	
Date:	14 April 2010
Signed by:	UK, Withers & Rogers LLP, S. Beck 12924
Capacity:	(Representative)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 90611-0356511	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/US06/34184	International filing date *(day/month/year)* 31 August 2006 (31.08.2006)	Priority date *(day/month/year)* 31 August 2005 (31.08.2005)
International Patent Classification (IPC) or national classification and IPC IPC: **G01L 15/18** USPC: 704/257		
Applicant VOICEBOX TECHNOLOGIES, INC.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *(sent to the applicant and to the International Bureau)* a total of ___ sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) _____ , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
	14 October 2008 (14.10.2008)
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Tom Dunn Telephone No. 571 272-1700

Form PCT/IPEA/409 (cover sheet)(April 2007)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US06/34184

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into English, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3(a) and 23.1(b))

☐ publication of the international application (under Rule 12.4(a))

☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☒ the international application as originally filed/furnished

☒ the description:
pages 1-16 as originally filed/furnished
pages* NONE received by this Authority on ____
pages* NONE received by this Authority on ____

☒ the claims:
pages 17-23 as originally filed/furnished
pages* NONE as amended (together with any statement) under Article 19
pages* NONE received by this Authority on ____
pages* NONE received by this Authority on ____

☒ the drawings:
pages 1-3 as originally filed/furnished
pages* NONE received by this Authority on ____
pages* NONE received by this Authority on ____

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages ____
☐ the claims, Nos. ____
☐ the drawings, sheets/figs ____
☐ the sequence listing (*specify*): ____
☐ any table(s) related to the sequence listing (*specify*): ____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages ____
☐ the claims, Nos. ____
☐ the drawings, sheets/figs ____
☐ the sequence listing (*specify*): ____
☐ any table(s) related to the sequence listing (*specify*): ____

5. ☐ This report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 70.2(e)).

** If item 4 applies, some or all of those sheets may be marked "superseded."*

Form PCT/IPEA/409 (Box No. I) (April 2007)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US06/34184

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims NONE	YES
	Claims 1-45	NO
Inventive Step (IS)	Claims NONE	YES
	Claims 1-45	NO
Industrial Applicability (IA)	Claims 1-45	YES
	Claims NONE	NO

2. Citations and Explanations (Rule 70.7)
Please See Continuation Sheet

Form PCT/IPEA/409 (Box No. V) (April 2007)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US06/34184

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

V. 2. Citations and Explanations:
Claims 1-45 lack novelty under PCT Article 33(2) as being anticipated by US 5,799,276 A to Komissarchik et al. (hereinafter 'KOMISSARCHIK').

As per claims 1, 16, and 31, KOMISSARCHIK discloses a system for interpreting speech (speech recognition system 10, fig. 1, col 7, ln 47 col 8, ln 39), with a corresponding method (recognition method 30, fig. 3, col 8, ln 46 col 16, ln 24) implemented by computer-executable instructions stored in a computer-readable medium (machine-readable programmed instructions stored in memory 17, fig. 1, col 8, ln 2-3), the system comprising: a device (e.g., microphone 11, fig. 1, col 7, ln 54) that receives a user verbalization (utterances, col 8, ln 48) and generates an electronic signal corresponding to the user verbalization (input signal, col8, ln 49); and a speech interpretation engine (CPU 14 and other peripherals in fig. 1) that receives the electronic signal corresponding to the user verbalization (via sound card 12, col 8, ln 50-56), wherein the speech interpretation engine parses the signal into a plurality of phonemes (a list of phoneme labels with transitions detected, col 10, ln 16-22) and generates at least one interpretation (correct spelling of the input signal utterance, col 16, ln 17-18) of the verbalization based on the plurality of phonemes.

As per claims 2-3, 17-18, and 32-33, KOMISSARCHIK further discloses that the generating the at least one preliminary interpretation (rough split, col 9, ln 25-34) includes traversing an acoustic grammar (e.g., phoneme garlands, col 10, ln 51; and rough rules, col 11, ln 66 col 12, ln 21), which is a phonemic representation (sequence of phoneme split segments, col 10, ln 59) of a speech signal, based on the plurality of phonemes.

As per claims 4-5, 19-20, and 34-35, KOMISSARCHIK further discloses that the acoustic grammar includes a linking element between segments, the linking element being an acoustic element (e.g., unstressed vowel, col 10, ln 65-66 and col 13, ln 45-46) in the speech signal.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US06/34184

Supplemental Box

As per claims 6, 11, 21, 26, 36, and 41, KOMISSARCHIK further discloses a speech sharpening engine (fine split, step 38, fig. 3, col 10, ln 25-58) configured to revise the at least one interpretation by generating a plurality of candidate interpretations (possible word choices, col 12, ln 61-65) of the verbalization; assign an interpretation score (characteristic points, col 14, ln 1-6) to each candidate interpretation; and
select a candidate interpretation with a highest interpretation score (best path, col 14, ln 7-19) as a probable interpretation of the verbalization.

As per claims 7, 12, 22, 27, 37, and 42, KOMISSARCHIK further discloses that the speech sharpening engine is configured to revise the at least one interpretation by applying the at least one interpretation against at least one domain agent (e.g., common triphon construction scheme, col 13, ln 51-63); identifying suspect words and/or phrases (word mapping, col 13, ln 24-29) in the at least one interpretation; identifying a closest phonetic match (matching, col 10, ln 59-61; the best of the candidate word strings, col 15, ln 66-67) for the suspect words and/or phrases based on a relative weighting (col 13, ln 17 col 14, ln 45) of parameters in at least one domain associated with the at least one domain agent; and substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation (candidate word list, col 15, col 13, ln 24-29).

As per claims 8, 13, 23, 28, 38, and 43, KOMISSARCHIK further discloses that the closest phonetic match is stored in an M-Tree (dendrogram with best n hypotheses, col 10, ln 32-41) and identifying the closest phonetic match includes using a closest-distance metric (minimum cost path based on a distance, col 65, ln 39 col 66, ln10) associated with the M-Tree.

As per claims 9, 14, 24, 29, 39, and 44, KOMISSARCHIK further discloses that the parameters include at least one of a context (col 42, ln 27-35) of the verbalization, a verbalization criteria (col 16, ln 1-7), a history of user verbalizations (e.g., statistics, col 14, ln 23-28; histogram of energy distribution, col 17, ln 50), a user profile (e.g., pitch period, col 18, ln 50-54), or domain specific information (e.g., a table of formant values for diphons or triphons, col 13, ln 64-67).

As per claims 10, 15, 25, 30, 40, and 45, KOMISSARCHIK discloses that the speech sharpening engine is further configured to adjust the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization (col 14, ln 13-18).

Claims 1-45 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

---------- NEW CITATIONS ----------
NONE

Europäisches Patentamt
European Patent Office
Office européen des brevets

REC'D 19 AUG 2008
WIPO PCT

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GERMANY
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Fax +49 (0)89 2399 - 4465

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SWITZERLAND

Formalities Officer
Name: Moser, Angela
Tel.: 8240
or call:
+31 (0)70 340 45 00

Date
18-08-2008

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 2225 PCT/US2006034184 / ISA US
Applicant/Proprietor	
Voicebox Technologies, Inc.	

For the aforementioned international application, you are hereby kindly requested to forward to the EPO in its capacity as designated / elected Office:

☐ a) The publication of the international search report (Art. 20 PCT).

☒ b) the International Preliminary Examination Report (Art. 36(3)(a) PCT).

☐ c) the copy (copies) of the priority document(s). If any document is not available and ISA is not the EP, please indicate below whether the receiving Office has been requested to transmit the document to the International Bureau (Form PCT/RO/101, Box VI; R. 17.1(b) PCT).

☐ d) the International Preliminary Report on Patentability (Chapter 1) (R. 44bis.2 PCT).

☐ e) the translation of the International Preliminary Report on Patentability (Chapter 1) (R. 44bis.3 PCT).

☐ .....

Receiving Section
Moser, Angela

EPO-DG 1
03. 09. 2008

Answer of the International Bureau [IB]:

☑ The requested item [a), b), c), d) and/or e)] is (are) not available with the IB.

Reason: .....THE REQUESTED DOCUMENT HAS NOT BEEN RECEIVED AT THE IB (IPEA/US)

For priority documents [c)] with ISA not EP:

☐ The applicant has requested the receiving Office to issue a priority document [c)] pursuant to Rule 17.1(b) PCT, but the IB did not receive it.

The International Bureau

Europäisches Patentamt
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European Patent Office
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Date: 18-08-2008

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 2225 PCT/US2006034184 / ISA US

Applicant/Proprietor: Voicebox Technologies, Inc.

For the aforementioned international application, you are hereby kindly requested to forward to the EPO in its capacity as designated / elected Office:

☐ a) The publication of the international search report (Art. 20 PCT).

☒ b) the International Preliminary Examination Report (Art. 36(3)(a) PCT).

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☐ d) the International Preliminary Report on Patentability (Chapter 1) (R. 44bis.2 PCT).

☐ e) the translation of the International Preliminary Report on Patentability (Chapter 1) (R. 44bis.3 PCT).

☐ .....

Receiving Section
Moser, Angela

Answer of the International Bureau [IB]:

☐ The requested item [a), b), c), d) and/or e)] is (are) not available with the IB.

Reason: .....

For priority documents [c)] with ISA not EP:

☐ The applicant has requested the receiving Office to issue a priority document [c)] pursuant to Rule 17.1(b) PCT, but the IB did not receive it.

The International Bureau

WITHERS & ROGERS
EUROPEAN & CHARTERED PATENT ATTORNEYS
TRADE MARK ATTORNEYS

Withers & Rogers LLP, Goldings House, 2 Hays Lane, London SE1 2HW
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European Patent Office
PB 5818 Patentlaan 2
Rijswijk
NL-2280 HV
Netherlands

Our Ref: P110079EP-PCT/SAB

Your Ref:

30 June 2008

EPO-DG 1
02 -07- 2008
(103)

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2 - 1224 BASED ON PCT/US2006/034184
"DYNAMIC SPEECH SHARPENING"
VOICEBOX TECHNOLOGIES, INC

In response to the Communication issued on the 27th May 2008, we write to inform you that the address for Robert A KENNEWICK is 13660 NE 42nd Street, Bellevue, Washington 98005, USA.

Yours faithfully

S A Beck
WITHERS & ROGERS LLP

From the INTERNATIONAL BUREAU

PCT

COMMUNICATION IN CASES FOR WHICH NO OTHER FORM IS APPLICABLE

To:

GATTO, James, G.
PILLSBURY WINTHROP SHAW PITTMAN LLP
P.O. Box 10500
Mclean, VA 22102
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 05 June 2008 (05.06.2008)	
Applicant's or agent's file reference 090611-0356511	**REPLY DUE** **see paragraph 1 below**
International application No. PCT/US2006/034184	International filing date *(day/month/year)* 31 August 2006 (31.08.2006)
Applicant VOICEBOX TECHNOLOGIES, INC. et al	

1. ☐ REPLY DUE within months/days from the above date of mailing
   ☐ NO REPLY DUE, however, see below
   ☒ IMPORTANT COMMUNICATION
   ☐ INFORMATION ONLY

2. COMMUNICATION:

The International Preliminary Report on Patentability (Chapter I of the PCT), Form PCT/IB/373, was erroneously issued on 13 March 2008 (13.03.2007) ("IPRP Chapter I"), and is hereby revoked.

The International Bureau should not have issued the IPRP Chapter I since a Demand for International Preliminary Examination has been made pursuant to Rule 54bis 1 (a)(i).

The International Bureau would therefore request that your Office disregard the IPRP Chapter I and consider instead the IPRP Chapter II which will be made available to your Office by the International Bureau.

A copy of the present communication is being sent to all designated Offices concerned and to the applicant.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 70 80

Authorized officer
Zoltanski Andrzej
e-mail pt11.pct@wipo.int
Telephone No. +41 22 338 74 11

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
Postbus 5818
2280 HV RIJSWIJK
NETHERLANDS
Tel. +31 (0)70 340-2040
Fax +31 (0)70 340-3016

Beck, Simon Antony
Withers & Rogers LLP
Goldings House,
2 Hays Lane
London SE1 2HW
GRANDE BRETAGNE

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Date: 09.06.08

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1224

Applicant/Proprietor: Voicebox Technologies, Inc.

☐ **Communication of corrected entries under Rule 139 EPC**

It is confirmed that your request for correction of the applicant under Rule 139 EPC has been allowed.

☒ **Communication concerning corrected entries of the applicant**

The entries concerning the applicant have been corrected and are now as follows:

Voicebox Technologies, Inc.
11980 NE 24th Street
Suite 100
Bellevue, WA 98005/US

Client Data Registration
Tel.: +49 (0)89 2399 2780

"pt11.pct"
<Pt11.Pct@wipo.int>
05-06-2008 11:25

To "Ana Rodriguez" <arodriguez@epo.org>
cc
bcc
Subject Re: 1210 request file data PCT/US 2006/034184 - WO 2007/027989

Dear Ana Rodriguez,

In response to your email below, please be informed that the amendment under Art. 19 for the a-m. international application were not take into consideration, because said documents reached the International Bureau after the time limit and consequently they are not published (communicated) by the International Bureau.

With best regards,

Andrzej Zoltanski
PT11

>>> Ana Rodriguez <arodriguez@epo.org> 21.05.2008 18:20 >>>
Dear Sirs,

For the aforementioned international application, you are hereby kindly requested to forward to the EPO in its capacity as designated / elected Office the International Preliminary Examination Report (IPRPII) with the amendment art 19 filed to the RO office on 24-10-07.

These information have been forwarded to us by the European representative based on the document we have at this stage in our records.

Thanks in advance

Best regards / Mit freundlichen Grüßen / Sincères salutations

Ana Rodriguez
LPS Phase 1 - Local Procedural Specialist Search Phase | Patent Administration
European Patent Office
Patentlaan 3-9 | 2288 EE Rijswijk | The Netherlands
Tel. +31 (0)70 340 2981
arodriguez@epo.org
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World Intellectual Property Organization Disclaimer:

This electronic message may contain privileged, confidential and copyright protected information. If you have received this e-mail by mistake, please immediately notify the sender and delete this e-mail and all its attachments. Please ensure all e-mail attachments are scanned for viruses prior to opening or using.

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Article 31(7) and Rule 61.2)

To:

European Patent Office
Postbus 5818
Patentlaan 2
NL-2280 HV RIJSWIJK
PAYS-BAS

in its capacity as elected Office

Date of mailing *(day/month/year)* 29 May 2008 (29.05.2008)	
International application No. PCT/US2006/034184	Applicant's or agent's file reference 090611-0356511
International filing date *(day/month/year)* 31 August 2006 (31.08.2006)	Priority date *(day/month/year)* 31 August 2005 (31.08.2005)
Applicant VOICEBOX TECHNOLOGIES, INC. et al	

1. The designated Office is hereby notified of its election made in the demand filed with the International Preliminary Examining Authority on

   26 October 2007 (26.10.2007)

2. The election ☐ was

   ☑ was not

   made before the expiration of 19 months from the priority date (PCT Article 39(1)(a)).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer

Nora Lindner

e-mail: pt11.pct@wipo.int

Form PCT/IB/331 (January 2004)

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
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GRANDE BRETAGNE

Date
28.05.08

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1224 PCT/US2006034184
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication of European publication number and information on the application of Article 67(3) EPC

The provisional protection under Article 67(1) and (2) EPC in the individual Contracting States becomes effective only when the conditions referred to in Article 67(3) EPC have been fulfilled (for further details, see information brochure of the European Patent Office "National Law relating to the EPC" and additional information in the Official Journal of the European Patent Office).

Pursuant to Article 153(3) EPC the publication under Article 21 PCT of an international application for which the European Patent Office is a designated or elected Office takes the place of the publication of a European patent application.

The bibliographic data of the above-mentioned Euro-PCT application will be published on 25.06.08 in Section I.1 of the European Patent Bulletin. The European publication number is 1934971.

In all future communications to the European Patent Office, please quote the application number plus Directorate number.

Receiving Section

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European Patent Office
Office européen des brevets

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For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Date
27.05.08

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1224 PCT/US2006034184

Applicant/Proprietor
Voicebox Technologies, Inc.

Communication pursuant to Rule 19(1) EPC

The communication issued pursuant to Rule 19(3) EPC, sent to the inventor designated below, has been returned by the postal services.
You are requested to indicate the correct address of the inventor (R. 19(1) EPC).

Inventor : KENNEWICK, Robert, A.
2204 S. Eddy St.
US / Seattle, WA 98108

Receiving Section

Ana Rodriguez/EPO
21-05-2008 18:20

To Pt11.Pct@wipo.int
cc
bcc Ana Rodriguez/EPO
Subject 1210 request file data PCT/US 2006/034184 - WO 2007/027989

Dear Sirs,

For the aforementioned international application, you are hereby kindly requested to forward to the EPO in its capacity as designated / elected Office the International Preliminary Examination Report (IPRPII) with the amendment art 19 filed to the RO office on 24-10-07.

These information have been forwarded to us by the European representative based on the document we have at this stage in our records.

Thanks in advance

Best regards / Mit freundlichen Grüßen / Sincères salutations

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LPS Phase 1 - Local Procedural Specialist Search Phase | Patent Administration
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arodriguez@epo.org
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Europäisches Patentamt | European Patent Office | Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	383503	
Application number	EP06814053.2	
Date of receipt	14 May 2008	
Receiving office	European Patent Office, The Hague	
Your reference	P110079EP/SAB	
Applicant	All applicants as on file	
Documents submitted	package-data.xml	ep-sfd-request.xml
	epf1038.pdf (1 p.)	R88-1.pdf\Letter.pdf (1 p.)
	PRIO-1.pdf\Response-to-WrittenOpinion.pdf (9 p.)	
Submitted by	CN=S. Beck 12924,O=Withers & Rogers LLP,C=UK	
Method of submission	Online	
Timestamp of receipt	14 May 2008, 17:19:31 (CEST)	
Digest	E9:91:78:67:34:29:15:5A:5F:D7:49:74:6D:93:18:4E:E2:60:F1:38	

/European Patent Office/

Europäisches Patentamt | European Patent Office | Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	383502	
Application number	EP06814053.2	
Date of receipt	14 May 2008	
Receiving office	European Patent Office, The Hague	
Your reference	P110079EP/SAB	
Applicant	All applicants as on file	
Documents submitted	package-data.xml	ep-sfd-request.xml
	epf1038.pdf (1 p.)	APPRCHOA-1.pdf\Letter.pdf (1 p.)
Submitted by	CN=S. Beck 12924,O=Withers & Rogers LLP,C=UK	
Method of submission	Online	
Timestamp of receipt	14 May 2008, 17:18:40 (CEST)	
Digest	7F:44:C3:B8:7E:9A:D5:CB:CC:3E:19:3D:BC:67:02:AD:2C:5B:FB:6F	

/European Patent Office/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
AS INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

IN RE INTERNATIONAL APPLICATION OF :	Philippe DI CRISTO et al.	INTERNATIONAL APPLICATION NO. :	PCT/US06/34184
INTERNATIONAL FILING DATE :	31 August 2006	AUTHORIZED OFFICER :	Lee W. Young
EARLIEST PRIORITY DATE :	31 August 2005	AGENT'S FILE REFERENCE :	090611-0356511
FOR :	DYNAMIC SPEECH SHARPENING		

RESPONSE TO WRITTEN OPINION

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Written Opinion dated **24 August 2007 (24.08.2007)** ("the Opinion"), Applicants hereby provide replacement pages amending the claims, and offer the following Remarks. A Demand for Chapter II Examination is also being submitted herewith.

AMENDMENTS

Please delete pages 17-23 of the as-filed Specification and replace them with Substitute Sheets 17-20 submitted herewith. Consequently, the Specification has 21 total pages remaining.

REMARKS

In response to the Opinion, claims 20-45 have been cancelled without prejudice or disclaimer, and claims 1-19 have been amended. No claims have been newly added. Accordingly, claims 1-19 are now pending. In view of the following Remarks, reconsideration

and withdrawal of the objections, along with issuance of a favorable International Preliminary Examination Report, is respectfully requested.

INDUSTRIAL APPLICABILITY

Applicants acknowledge with appreciation the Authorized Officer's indicating that claims 1-45 (as filed) have industrial applicability as defined by PCT Article 33(4).

NOVELTY

In the Opinion, the Authorized Officer alleges that claims 1-45 (as filed) lack novelty under PCT Article 33(2) as allegedly being anticipated by U.S. Patent No. 5,799,276 to Komissarchik ("Komissarchik"). Applicants submit that amended claims 1-19 are not anticipated by Komissarchik for at least the reason that Komissarchik fails to disclose each and every feature of the claimed invention.

More particularly, Komissarchik does not disclose at least the feature of "generating at least one interpretation of the utterance, wherein the generated interpretation includes the series of syllables mapped to the recognized stream of phonemes," as recited in claim 1, for example. Specifically, Komissarchik indicates that the "natural language speech recognition system incorporates knowledge of acoustics, phonetics, syntax and the semantics of a selected language . . . to select with high confidence *the word* corresponding to the spoken utterance *from a large vocabulary*" (col. 5, lines 19-28).

On the other hand, claim 1 relates to "providing *out-of-vocabulary interpretation capabilities*" by generating interpretations of an utterance as a "series of *syllables* mapped to [a] recognized stream of phonemes." Thus, because Komissarchik generates interpretations of utterances in the form of "word strings" (e.g., by filtering and transforming "word garlands"), Komissarchik fails to disclose at least the feature of "generating at least one interpretation of the utterance, wherein the generated interpretation includes the series of syllables mapped to the recognized stream of phonemes," as recited in claim 1, for example.

Furthermore, Komissarchik does disclose at least the feature of "mapping the recognized stream of phonemes to an acoustic grammar that phonemically represents one or

more syllables," as recited in claim 1, for example. In a similar respect, Komissarchik does disclose at least the feature of "constructing an acoustic grammar that contains transitions between the acoustic elements of the represented syllables," as recited in claim 17, for example. Specifically, to the extent that Komissarchik discusses recognition grammars that may be considered similar or otherwise analogous to the "acoustic grammar" recited in the claimed invention, Komissarchik describes a "grammar . . . [that] constitutes a table-like representation of a formal augmented transition network," which reflects "grammatical compatibility of distantly located parts of *the sentence* and finds all admissible variants of *the sentence's syntactic structure*" (col. 15, lines 19-25).

By contrast, claims 1 and 17 respectively recite an "acoustic grammar that phonemically represents one or more syllables" and "an acoustic grammar that contains transitions between the acoustic elements of the represented syllables." Thus, the claimed acoustic grammars can take a series of *phonemes* as an input to identify corresponding *syllables*. On the other hand, Komissarchik uses a grammar that "takes as its input the candidate *word strings*," meaning that the grammar contains "descriptions of structural *phrases* possible in a *sentence*" (col. 15, lines 45-55). As such, Komissarchik does not disclose the use of "an acoustic grammar that phonemically represents one or more *syllables*," as recited in claim 1, nor does Komissarchik disclose the use of "an acoustic grammar that contains transitions between the acoustic elements of the represented syllables," as recited in claim 17, for example.

Accordingly, for at least the foregoing reasons, Komissarchik fails to disclose each and every feature recited in claims 1 and 17. Claim 9 includes features similar to those set forth in claim 1. Claims 2-8, 10-16, and 18-19 depend from and add features to one of claims 1, 9, and 17. Accordingly, claims 1-19 have novelty with respect to Komissarchik.

CONCLUSION

On the basis of the foregoing, Applicants respectfully request reconsideration. A favorable International Preliminary Examination Report is believed to be in order, as pending claims 1-19 all of the requirements of PCT Article 33.

If the Authorized Officer believes, for any reason, that personal communication will expedite prosecution of this application, the Authorized Officer is invited to telephone the undersigned at the number provided.

Date: **October 24, 2007**

Respectfully submitted,

By: _____

Syed Jafar Ali
Registration No. 58,780

PILLSBURY WINTHROP SHAW PITTMAN LLP
P.O. Box 10500
McLean, Virginia 22102
Main: 703-770-7900
Direct: 703-770-7540
Fax: 703-770-7901

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
AS INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY**

IN RE INTERNATIONAL APPLICATION OF :	Philippe DI CRISTO et al.	INTERNATIONAL APPLICATION NO. :	PCT/US06/34184
INTERNATIONAL FILING DATE :	31 August 2006	AUTHORIZED OFFICER :	Lee W. Young
EARLIEST PRIORITY DATE :	31 August 2005	AGENT'S FILE REFERENCE :	090611-0356511
FOR :	DYNAMIC SPEECH SHARPENING		

AMENDMENT UNDER ARTICLE 19 AND LETTER PURSUANT TO § 205(B)

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the International Search Report and Written Opinion dated **24 August 2007 (24.08.2007)**, and pursuant to Article 19 *et seq.* and Rule 46 *et seq.*, please amend the above-identified application as indicated on Substitute Sheets 17-20 submitted herewith and as explained herein.

Pursuant to Article 19(1) and Section 205(b), Applicants note that claims 1-45 were originally filed. Claims 1-19 are amended, claims 20-45 are cancelled, and no claims are newly added. Accordingly, claims 1-19 as originally filed are to be replaced with the amended claims 1-19 as outlined below. The International Application as originally filed fully support the claims amendments contained herein, and the amendments have no impact on the description or drawings.

Date: **October 24, 2007**

Respectfully submitted,

By: _____

Syed Jafar Ali
Registration No. 58,780
PILLSBURY WINTHROP SHAW PITTMAN LLP
P.O. Box 10500
McLean, Virginia 22102
Main: 703-770-7900
Fax: 703-770-7901

ATTACHMENTS:
Substitute Sheets 17-20 (showing claims 1-19)

CLAIMS

What is claimed is:

1. A method for providing out-of-vocabulary interpretation capabilities and for tolerating noise when interpreting natural language speech utterances, the method comprising:

receiving an utterance from a user;

recognizing a stream of phonemes contained in the utterance;

mapping the recognized stream of phonemes to an acoustic grammar that phonemically represents one or more syllables, the recognized stream of phonemes mapped to a series of one or more of the phonemically represented syllables; and

generating at least one interpretation of the utterance, wherein the generated interpretation includes the series of syllables mapped to the recognized stream of phonemes.

2. The method of claim 1, the acoustic grammar phonemically representing the one or more syllables in accordance with acoustic elements of an acoustic speech model, wherein each syllable is represented by acoustic elements for an onset, a nucleus, and a coda.

3. The method of claim 2, the acoustic grammar including transitions between the acoustic elements, wherein the transitions are constrained according to phonotactic rules of the acoustic speech model.

4. The method of claim 3, the acoustic elements including at least an unstressed central vowel and a plurality of phonemic elements associated with the acoustic speech model, wherein the acoustic grammar uses the unstressed central vowel as a linking element between sequential phonemic elements.

5. The method of claim 4, the unstressed central vowel including a *schwa* acoustic element.

6. The method of claim 1, further comprising:

generating a plurality of candidate interpretations of the utterance, wherein each candidate interpretation includes a series of words or phrases corresponding to the series of syllables mapped to the recognized stream of phonemes;

assigning a score to each of the plurality of candidate interpretations; and

selecting a candidate interpretation having a highest assigned score as being a probable interpretation of the utterance.

7. The method of claim 6, wherein generating the plurality of candidate interpretations of the utterance includes:

identifying a series of words or phrases possibly corresponding to the series of syllables mapped to the recognized stream of phonemes; and

providing the identified series of words or phrases to a plurality of domain agents, each of the plurality of domain agents generating a candidate interpretation by:

identifying any suspect words or phrases among the identified series of words or phrases;

identifying one or more closest phonetic matches for the identified suspect words or phrases using a closest-distance metric associated with an M-Tree; and

substituting the identified closest phonetic matches for the identified suspect words or phrases to generate the candidate interpretation.

8. The method of claim 7, wherein identifying the series of words or phrases possibly corresponding to the series of syllables includes using one or more of a context associated the utterance, criteria identified in the utterance, a history of previous utterances, user profile information, or domain specific information.

9. A system for providing out-of-vocabulary interpretation capabilities and for tolerating noise when interpreting natural language speech utterances, the system comprising:

at least one input device that receives an utterance from a user and generates an electronic signal corresponding to the utterance; and

a speech interpretation engine that receives the electronic signal corresponding to the utterance, the speech interpretation engine operable to:

recognize a stream of phonemes contained in the utterance;

map the recognized stream of phonemes to an acoustic grammar that phonemically represents one or more syllables, the recognized stream of phonemes mapped to a series of one or more of the phonemically represented syllables; and

generate at least one interpretation of the utterance, wherein the generated interpretation includes the series of syllables mapped to the recognized stream of phonemes.

10. The system of claim 9, the acoustic grammar phonemically representing the one or more syllables in accordance with acoustic elements of an acoustic speech model, wherein each syllable is represented by acoustic elements for an onset, a nucleus, and a coda.

11. The system of claim 10, the acoustic grammar including transitions between the acoustic elements, wherein the transitions are constrained according to phonotactic rules of the acoustic speech model.

12. The system of claim 11, the acoustic elements including at least an unstressed central vowel and a plurality of phonemic elements associated with the acoustic speech model, wherein the acoustic grammar uses the unstressed central vowel as a linking element between sequential phonemic elements.

13. The system of claim 12, the unstressed central vowel including a schwa acoustic element.

14. The system of claim 9, further comprising a sharpening engine that receives the generated interpretation of the utterance from the speech interpretation engine, the sharpening engine operable to:

generate a plurality of candidate interpretations of the utterance, wherein each candidate interpretation includes a series of words or phrases corresponding to the series of syllables mapped to the recognized stream of phonemes;

assign a score to each of the plurality of candidate interpretations; and

select a candidate interpretation having a highest assigned score as being a probable interpretation of the utterance.

15. The system of claim 14, the sharpening engine operable to generate the plurality of candidate interpretations of the utterance by:

identifying a series of words or phrases possibly corresponding to the series of syllables mapped to the recognized stream of phonemes; and

providing the identified series of words or phrases to a plurality of domain agents, each of the plurality of domain agents generating a candidate interpretation by:

identifying any suspect words or phrases among the identified series of words or phrases;

identifying one or more closest phonetic matches for the identified suspect words or phrases using a closest-distance metric associated with an M-Tree; and

substituting the identified closest phonetic matches for the identified suspect words or phrases to generate the candidate interpretation.

16. The system of claim 15, the sharpening engine operable to identify the series of words or phrases possibly corresponding to the series of syllables using one or more of a context associated the utterance, criteria identified in the utterance, a history of previous utterances, user profile information, or domain specific information.

17. A method for reducing a search space for a recognition grammar used when interpreting natural language speech utterances, the method comprising:

creating a phonemic representation of acoustic elements associated with an acoustic speech model, the acoustic elements including at least an unstressed central vowel and plurality of phonemic elements;

representing syllables associated with the acoustic speech model using the phonemic representation, each of the represented syllables including a series of acoustic elements;

constructing an acoustic grammar that contains transitions between the acoustic elements of the represented syllables, the transitions constrained according to phonotactic rules of the acoustic speech model; and

using the unstressed central vowel as a linking element between sequential phonemic elements contained in the constructed acoustic grammar.

18. The method of claim 17, the series of acoustic elements defining an onset, a nucleus, and a coda for a given one of the represented syllables.

19. The method of claim 18, the unstressed central vowel including a *schwa* acoustic element.

WITHERS & ROGERS LLP

EUROPEAN & CHARTERED PATENT ATTORNEYS
TRADE MARK ATTORNEYS

Withers & Rogers LLP, Goldings House, 2 Hays Lane, London, SE1 2HW
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E-Mail: admin@withersrogers.com Web: www.withersrogers.com

European Patent Office
PB 5818 Patentlaan 2
Rijswijk
NL-2280 HV
Netherlands

Our Ref: P110079EP-PCT/SAB

Your Ref:

14 May 2008

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2 BASED ON PCT/US2006/034184
"DYNAMIC SPEECH SHARPENING"
VOICEBOX TECHNOLOGIES, INC

Further to our letter of 28th April 2008 indicating that, in our view, only claims 1 to 19 are pending we herewith enclose a copy of the response filed by the agents responsible for this case during its international phase providing remarks on the Written Opinion and amended claims in response thereto.

We request that these claims as amended form the basis of the claims used in Examination by the European Patent Office.

Yours faithfully

S A Beck
WITHERS & ROGERS LLP

Enc. Copy of response to Written Opinion

Withers & Rogers LLP is a limited liability partnership registered in England and Wales (registered number OC310992) with its principal place of business and registered office at Goldings House, 2 Hays Lane, London, SE1 2HW

Also at 1 Redcliff Street, Bristol, BS1 6NP Tel: +44 (0)117 925 3030 Fax: +44 (0)117 925 3530 and
Nicholas Wilson House, Dormer Place, Leamington Spa, Warwickshire, CV32 5AE Tel: +44 (0)1926 310700 Fax: +44 (0)1926 335519

R01 04/08

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

Sender:

Mr. Simon BECK
Withers & Rogers LLP
Goldings House
2 Hays Lane
London SE1 2HW
United Kingdom

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP/SAB

	Description of document	Original file name	Assigned file name
1	Request for change of address	Letter.pdf	APPRCHOA-1.pdf

	Payment	
1	Mode of payment	Not specified

Annotations

Statement
The undersigned hereby declares that the subsequently filed items do NOT contain or are NOT intended to contain any communication relating either an appeal, an opposition, a limitation, a revocation proceeding or any proceedings for review (Special edition No. 3 OJ EPO 2007, A.4. Article 2(3) "Paragraph 1 shall not apply to documents in opposition proceedings, in European patent limitation or revocation proceedings, in appeal proceedings, or in proceedings for review by the Enlarged Board of Appeal of decisions of the boards of appeal.").

Signatures

Place:	
Date:	**14.May 2008**
Signed by:	**UK, Withers & Rogers LLP, S. Beck 12924**
Capacity:	**(Representative)**

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

Sender:

Mr. Simon BECK
Withers & Rogers LLP
Goldings House
2 Hays Lane
London SE1 2HW
United Kingdom

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Netherlands
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10958 Berlin
Germany
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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	06814053.2
Applicant's or representative's reference	P110079EP/SAB

	Description of document	Original file name	Assigned file name
1	Rule 139: Request for correction of the documents	Letter.pdf	R88-1.pdf
2	Document concerning the priority claims	Response-to-WrittenOpinion.pdf	PRIO-1.pdf

	Payment	
1	Mode of payment	Not specified

Annotations

Statement
The undersigned hereby declares that the subsequently filed items do NOT contain or are NOT intended to contain any communication relating either an appeal, an opposition, a limitation, a revocation proceeding or any proceedings for review (Special edition No. 3 OJ EPO 2007, A.4. Article 2(3) "Paragraph 1 shall not apply to documents in opposition proceedings, in European patent limitation or revocation proceedings, in appeal proceedings, or in proceedings for review by the Enlarged Board of Appeal of decisions of the boards of appeal.").

Signatures

Place:	
Date:	**14.May 2008**
Signed by:	**UK, Withers & Rogers LLP, S. Beck 12924**
Capacity:	**(Representative)**

WITHERS & ROGERS LLP

EUROPEAN & CHARTERED PATENT ATTORNEYS
TRADE MARK ATTORNEYS

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Tel: +44 (0)20 7663 3500 Fax: +44 (0)20 7663 3550
E-Mail: admin@withersrogers.com Web: www.withersrogers.com

European Patent Office
PB 5818 Patentlaan 2
Rijswijk
NL-2280 HV
Netherlands

Our Ref: P110079EP-PCT/SAB

Your Ref:

14 May 2008

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2 BASED ON PCT/US2006/034184
"DYNAMIC SPEECH SHARPENING"
VOICEBOX TECHNOLOGIES, INC

Further to the official letter of 18th April 2008 confirming that the proprietor details had been amended, we note that "Belevue" should be spelt with 2 ll's rather than the one (Bellevue) rather than the one held on the European Patent Office's records. We request that a further correction to the address be made.

Yours faithfully

S A Beck
WITHERS & ROGERS LLP

Withers & Rogers LLP is a limited liability partnership registered in England and Wales (registered number OC310992) with its principal place of business and registered office at Goldings House, 2 Hays Lane, London, SE1 2HW

Also at 1 Redcliff Street, Bristol, BS1 6NP Tel: +44 (0)117 925 3030 Fax: +44 (0)117 925 3530 and
Nicholas Wilson House, Dormer Place, Leamington Spa, Warwickshire, CV32 5AE Tel: +44 (0)1926 310700 Fax: +44 (0)1926 335519

R01 04/08

Europäisches Patentamt
European Patent Office
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Telefonische Rücksprache / Consultation by telephone / Entretien téléphonique

Mit dem ☐ Anmelder ☐ Vertreter
With the ☐ applicant ☒ representative
Avec le ☐ demandeur ☐ mandataire

und zwar / i.e. / c'est-à-dire

mit / with / avec : Mr Beck Simon tel 0044 117 925 3030

Anmeldung Nr. / Application No. / Demande N° 06814053.2

Gegenstand / Subject / Objet :

Based on letter received on the 02-05-08 :

I phoned Mr Beck to inform that the file as constituted at this stage has 45 claims and that we received a payment for 9 extra claims. Therefore communication 1226 is correct.

Mr Beck explained that a request Chapt 2 has been filed at US office with amended claims. According to WIPO patentscope and our information we do not have any trace of this request.

Mr Beck will file within the time limit of 1226 amended claims.

Rijswijk, 09-05-2008 / Rodriguez, Ana
Datum/date Uhrzeit/time/heure Unterschrift/signature

AR03837

EPO Form 1326 12.07

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KENNEWICK, Robert, A.
2204 S. Eddy St.
Seattle, WA 98108
ETATS-UNIS D'AMERIQUE

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Date
11.04.08

Reference	Application No./Patent No.
	06814053.2 - 1224 PCT/US2006034184

Applicant/Proprietor
Voicebox Technologies, Inc.

Notification of the data mentioned in Rule 19(3) EPC

In the above-identified patent application you are designated as inventor/co-inventor.
Pursuant to Rule 19(3) EPC the following data are notified herewith:

DATE OF FILING	: 31.08.06
PRIORITY	: US/31.08.05/ USP 712412
TITLE	: DYNAMIC SPEECH SHARPENING
DESIGNATED STATES	: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

Receiving Section

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PRIORITY
PRIORITAIRE

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Port betaald
Port Payé
Pays-Bas

EPA EPO OEB
tel.: (070) 3404616

07 MAY 2008

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E-Mail: admin@withersrogers.com Web: www.withersrogers.com

Our Ref: P110079EP-PCT/SAB

Your Ref:

European Patent Office
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Rijswijk
NL-2280 HV
Netherlands

EPO-DG 1
02 -05- 2008
(103)

28 April 2008

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2 BASED ON PCT/US2006/034184
"DYNAMIC SPEECH SHARPENING"
VOICEBOX TECHNOLOGIES, INC

We refer to the Communication under Rule 161 and 162 EPC of the 22nd April 2008. According to our records, the claims were amended in response to the International Search and Written Opinion such that only claims 1 to 19 are pending.

Yours faithfully

S Beck

S A Beck
WITHERS & ROGERS LLP

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Beck, Simon Antony
Withers & Rogers LLP
Goldings House,
2 Hays Lane
London SE1 2HW
GRANDE BRETAGNE

Date
22-04-2008

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1224 PCT/US2006034184

Applicant/Proprietor
Voicebox Technologies, Inc.

Communication pursuant to Rules 161 and 162 EPC

(1) Amendment of application documents, especially the claims (R. 161 EPC)

The above mentioned international (Euro-PCT) application has entered the European phase.

Under Articles 28, 41 PCT, Rules 52, 78 PCT and Rule 137(2) to (4) EPC, the applicant may amend the application documents after receiving the international search report.

Whether or not he has already done so, he now has a further opportunity to file amended claims or other application documents within a non-extendable period of ONE MONTH after notification of the present communication (R. 161 EPC).

The claims applicable on expiry of the above time limit, i.e. those filed on entry into the European phase or in response to the present communication, will form the basis for the calculation of any claims fee to be paid (see page 2) and for any supplementary search to be carried out under Article 153(7) EPC (R. 161 EPC).

--2/

Registered letter
EPO Form 1226 04.08 EUCL

(2) Claims fees under Rule 162 EPC

If the application documents on which the European grant procedure is to be based comprise more than fifteen claims, a claims fee shall be payable for the sixteenth and each subsequent claim within the period provided for in Rule 159(1) EPC.

☐ Based on the application documents currently on file, all necessary claims fees have already been paid (or the documents do not comprise more than 15 claims)

☐ All necessary fees will be/have been debited automatically according to the automatic debit order.

☑ The claims fees due for the claims 16 to 20 ~~45~~ were not paid within the above-mentioned period.

Any non-paid claims fee, either based on the current set of claims or on any amended claims to be filed pursuant to Rule 161 EPC (see page 1), may still be validly paid within a non-extendable period of **one month** after notification of this communication (R. 162(2) EPC).

If a payment is made for only some of the claims, it must be indicated for which claims it is intended. If a claims fee is not paid in due time, the claim concerned is deemed to be abandoned (R. 162(4) EPC).

If claims fees have already been paid, but on expiry of the above-mentioned period there is a new set of claims containing fewer fee-incurring claims than previously, the claims fees in excess of those due under Rule 162(2), 2nd sentence EPC will be refunded (R. 162(3) EPC).

You are reminded that any supplementary search under Article 153(7) EPC will relate only to the last set of claims applicable on expiry of the above period AND will be confined to those fee-incurring claims for which fees have been paid in due time.

The fee for the sixteenth and each subsequent claim is EUR 200,00.

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A payment of 405,00 Euro as claim fee has been received on 26-03-2008. This correspond to 9 claims for payment before 01-04-2008.

Therefore are claims 1-19 paid and, if no amendment is filed, claims 20-45 (26 claims) are still to be paid.

Please note the new fee for each claims for payment after 01-04-2008: 200,00 Euro.
(26 claims x 200 = 5.200,00 Euro)

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Beck, Simon Antony
Withers & Rogers LLP
Goldings House,
2 Hays Lane
London SE1 2HW
GRANDE BRETAGNE

Date
18.04.08

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1224
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication

concerning the registration of amendments relating to

☐ a transfer (R. 22 and 85 EPC)

☑ entries pertaining to the applicant / the proprietor (R. 143(1)(f) EPC)

As requested, the entries pertaining to the applicant of the above-mentioned European patent application / to the proprietor of the above-mentioned European patent have been amended to the following:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Voicebox Technologies, Inc.
11980 NE 24th Street
Suite 100
Belevue, WA 98005/US

The registration of the changes has taken effect on 26.03.08.

In the case of a published application / a patent, the change will be recorded in the Register of European Patents and published in the European Patent Bulletin (Section I.12 / II.12).

Your attention is drawn to the fact that, in the case of the registration of a transfer, any automatic debit order only ceases to be effective from the date of its express revocation (cf. point 14(c) of the Arrangements for the automatic debiting procedure, Supplement to OJ EPO 10/2007).

Client Data Registration
Tel.: +49 (0)89 2399 2780

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Beck, Simon Antony
Withers & Rogers LLP
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London SE1 2HW
GRANDE BRETAGNE

Date
10.04.08

Reference	Application No./Patent No.
P110079EP/SAB	06814053.2 - 1224 PCT/US2006034184
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication pursuant to the Decision of the President of the European Patent Office dated 12 July 2007 on the filing of priority documents (Special edition No. 3, OJ EPO 2007, 22)

Please be informed that the priority document(s) listed below has (have) been included in the file of the above-mentioned European patent application (R. 53(2) EPC). It should be noted that, for technical reasons, this communication may be issued not only if the priority document has been included in the file electronically in accordance with the above-mentioned Decision but also if it was filed by the applicant.

State:	Date of filing:	Application number:
US	31.08.05	USP 712412

Receiving Section

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10505 NE 38th Placw, Building 9
Kirkland WA 98033
ETATS-UNIS D'AMERIQUE

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Date: 14.03.08

Reference	Application No./Patent No.
	06814053.2 - 1224 PCT/US2006034184

Applicant/Proprietor: Voicebox Technologies, Inc.

Communication pursuant to the Decision of the President of the European Patent Office dated 12 July 2007 on the filing of priority documents (Special edition No. 3, OJ EPO 2007, 22)

Please be informed that the priority document(s) listed below has (have) been included in the file of the above-mentioned European patent application (R. 53(2) EPC). It should be noted that, for technical reasons, this communication may be issued not only if the priority document has been included in the file electronically in accordance with the above-mentioned Decision but also if it was filed by the applicant.

State:	Date of filing:	Application number:
US	31.08.05	USP 712412

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tel.: (070) 3404616

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BC: 00100 *2589-03097-19-18

98033379

4.111

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Acknowledgement of receipt

We hereby acknowledge receipt of the form for entry into the European phase (EPO as designated or elected Office) as follows:

Submission number	359493	
PCT application number	PCT/US2006/034184	
EP application number	06814053.2	
Date of receipt	26 March 2008	
Receiving Office	European Patent Office, The Hague	
Your reference	P110079EP/SAB	
Applicant		
Country		
Documents submitted	package-data.xml	ep-euro-pct.xml
	application-body.xml	epf1200.pdf (3 p.)
	OTHER-1.pdf\Additional representatives.pdf (1 p.)	OTHER-2.pdf\Letter.pdf (1 p.)
Submitted by	CN=S. Beck 12924,O=Withers & Rogers LLP,C=UK	
Method of submission	Online	
Date and time receipt generated	26 March 2008, 14:32:35 (CET)	
Digest	61:6E:46:16:74:C5:86:AB:49:A4:66:D8:D8:11:BD:13:C8:9E:51:54	

/European Patent Office/

EUROPEAN & CHARTERED PATENT ATTORNEYS
TRADE MARK ATTORNEYS

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E-Mail: admin@withersrogers.com Web: www.withersrogers.com

European Patent Office
PB 5818 Patentlaan 2
Rijswijk
NL-2280 HV
Netherlands

Our Ref: P110079EP-PCT/SAB

Your Ref:

25 March 2008

SIGNED AND SENT ELECTRONICALLY

Writer's Telephone: +44 (0)117 925 3030

Dear Sirs

EUROPEAN PATENT APPLICATION NO. 06814053.2 BASED ON PCT/US2006/034184
"DYNAMIC SPEECH SHARPENING"
VOICEBOX TECHNOLOGIES, INC

Please find attached a form 1200 in respect of the above application.

Please also note that the applicant, Voice Box Technologies, Inc have changed their address and are now located at:

11980 NE 24th Street
Suite 100
Bellevue
WA 98005
United States of America

Yours faithfully

S A Beck
WITHERS & ROGERS LLP

Withers & Rogers LLP is a limited liability partnership registered in England and Wales (registered number OC310992) with its principal place of business and registered office at Goldings House, 2 Hays Lane, London, SE1 2HW

Also at 1 Redcliff Street, Bristol BS1 6NP Tel: +44 (0)117 925 3030 Fax: +44 (0)117 925 3530 and
Nicholas Wilson House, Dormer Place, Leamington Spa, Warwickshire CV32 5AE Tel: +44 (0)1926 310700 Fax: +44 (0)1926 335519

R14 09/07

Europäisches Patentamt
European Patent Office
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Entry into the European phase (EPO as designated or elected Office)

To the European Patent Office

European application number	
PCT application number	PCT/US2006/034184
PCT publication number	WO2007027989
Applicant's or representative's reference	P110079EP/SAB

1. Applicant

Indications concerning the applicant(s) are contained in the international publication or were recorded by the International Bureau after the international publication. ☒

Changes which have not yet been recorded by the International Bureau are set out here: ☐

2. Representative

This is the representative who will be listed in the Register of European Patents and to whom notifications will be made

Representative 1

Name	BECK, Mr. Simon
Registration No	1.8
Company:	Withers & Rogers LLP
Address of place of business:	Goldings House 2 Hays Lane London, SE1 2HW United Kingdom
Telephone	+44 117 925 3030
Fax	+44 117 925 3530
e-mail	

3. Authorisation

An individual authorisation is attached. ☐

A general authorisation has been registered under No: ☐

A general authorisation has been filed, but not yet registered. ☐

The authorisation filed with the EPO as PCT receiving Office expressly includes the European phase. ☐

4. Request for examination

Examination of the application under Art. 94 EPC is hereby requested. The examination fee is being (has been, will be) paid. ☒

Request for examination in an admissible non-EPO language: ☐

The applicant waives his right to be asked under Rule 70(2) EPC whether he wishes to proceed further with the application. ☐

5. Copies

Additional sets of copies of the documents cited in the supplementary European search report are requested. ☒

Number of additional sets of copies: 1

6. Documents intended for proceedings before the EPO

6.1 Proceedings before the EPO as designated Office (PCT I) are to be based on the following documents:

the application documents published by the International Bureau (with all claims, description and drawings), where applicable with amended claims under Art. 19 PCT ☐

unless replaced by the amendments attached. ☐

Where necessary, clarifications should be attached as 'Other documents'

6.2 Proceedings before the EPO as elected Office (PCT II) are to be based on the following documents:	
the documents on which the international preliminary examination report is based, including any annexes	☒
unless replaced by the amendments attached.	☐
Where necessary, clarifications should be attached as 'Other documents'	
If the EPO as International Preliminary Examining Authority has been supplied with test reports, these may be used as the basis of proceedings before the EPO.	☒
7. Translations	
Translations in one of the official languages of the EPO (English, French, German) are attached as crossed below:	☐
** In proceedings before the EPO as designated or elected Office (PCT I + II):*	
Translation of the international application (description, claims, any text in the drawings) as originally filed, of the abstract as published and of any indication under Rule 13bis.3 and 13bis.4 PCT regarding biological material	☐
Translation of the priority application(s) (to be filed only at the EPO's request, Rule 53(3) EPC)	☐
It is hereby declared that the international application as originally filed is a complete translation of the previous application (Rule 53(3) EPC)	☐
** In addition, in proceedings before the EPO as designated Office (PCT I):*	
Translation of amended claims and any statement under Art. 19 PCT, if the claims as amended are to form the basis for the proceedings before the EPO (see Section 6).	☐
** In addition, in proceedings before the EPO as elected Office (PCT II):*	
Translation of annexes to the international preliminary examination report	☐
8. Biological material	
The invention uses and/or relates to biological material deposited under Rule 31 EPC.	☐
The particulars referred to in Rule 31(1)(c) EPC (if not yet known, the depositary institution and the identification reference(s)) [number, symbols, etc.] of the depositor) are given in the international publication or in the translation submitted in Section 7 on:	☐
page(s) / line(s)	
The receipt(s) of deposit issued by the depositary institution	
is (are) enclosed.	☐
will be filed later.	☐
Waiver of the right to an undertaking from the requester pursuant to Rule 33(2) EPC attached.	☐
9. Nucleotide and amino acid sequences	
The items pursuant to Rules 5.2 and 13ter PCT, Rules 30 and 163(3) EPC are already with the EPO.	☐
The sequence listing is attached in PDF format.	☐
The sequence listing does not include matter which goes beyond the content of the application as filed.	☐
The sequence listing data is also attached in computer-readable form in accordance with WIPO Standard 25.	☐
The sequence listing data in computer-readable form in accordance with WIPO Standard 25 is identical to the sequence listing in PDF format.	☐
10. Designation fees	
All the contracting states party to the EPC at the time of filing of the international patent application and designated in the international application are deemed to be designated (see Article 79(1) EPC).	☒
AT BE BG CH&LI CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LT LU LV MC NL PL PT RO SE SI SK TR	
10.1 It is currently intended to pay fewer than seven designation fees, for the following contracting states:	☐
10.2 If contracting states are indicated in Section 10.1, it is agreed that for the contracting states not thus indicated no communication under Rule 112(1) EPC	☐

be issued and further processing be excluded.

11. Extension of the European patent

This application is deemed to be a request to extend the European patent application and the European patent granted in respect of it to all the non-contracting states to the EPC designated in the international application and with which extension agreements are in force on the date on which the international application is filed. However, the extension only takes effect if the prescribed extension fee is paid. ☐

It is currently intended to pay the extension fee for the following states:

Note: Under the automatic debiting procedure, extension fees will only be debited for states indicated here, unless the EPO is instructed otherwise before expiry of the period for payment.

12. List of enclosed documents

	Description of document	Original file name	Assigned file name
1	Additional Representatives	Additional representatives.pdf	OTHER-1.pdf
2	Letter	Letter.pdf	OTHER-2.pdf

13. Mode of payment: Debit from deposit account ☒

Currency: EUR

The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated on the fees page.

Deposit account number: 28050082

Account holder: Withers & Rogers LLP

14. Any refunds should be made to the following EPO deposit account: ☒

Number and account holder: Withers & Rogers LLP, 28050082

15. Fees

		Factor/reduction applied	Fee schedule	Amount to be paid
15-1	002 Fee for (supplementary) European search for applications filed on/after 01.07.2005	-190	1 000.00	810.00
15-2	005 Designation fee All designated states	7	80.00	560.00
15-3	006 Examination fee (EP and Euro-PCT with supplementary European search report)	1	1 335.00	1 335.00
15-4	015 Claims fee	9	45.00	405.00
15-5	020 Filing fee - entry EP phase (Rule 159(1)(c) EPC)	1	95.00	95.00
15-6	033 Renewal fee for the 3rd year	1	400.00	400.00
15-7	055 Additional copy	1	25.00	25.00
	Total:		EUR	**3 630.00**

16. Annotations

17. Signature(s) of applicant(s) or representative

Place:

Date: 26.March 2008

Signed by: UK, Withers & Rogers LLP, S. Beck 12924

Capacity: (Representative)

ADDITIONAL REPRESENTATIVES

WITHERS & ROGERS LLP

GOLDINGS HOUSE, 2 HAYS LANE, LONDON, SE1 2HW

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N. A. Jones
R. G. Barton
N. R. Wallis
P. M. J. Foot
P. M. J. Watterson

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 090611-0356511	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2006/034184	International filing date *(day/month/year)* 31 August 2006 (31.08.2006)	Priority date *(day/month/year)* 31 August 2005 (31.08.2005)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant VOICEBOX TECHNOLOGIES, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 04 March 2008 (04.03.2008)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt11.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: James G. Gatto
Pillsbury Winthrop Shaw Pittman LLP
P.O. Box 10500
McLean, VA 22102

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	24 AUG 2007
Applicant's or agent's file reference 090611-0356511	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 06/34184	31 August 2006 (31.08.2006)	31 August 2005 (31.08.2005)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G10L 15/18 (2007.01)
USPC - 704/257

Applicant VoiceBox Technologies, Inc.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	03 May 2007 (03.05.2007)	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 06/34184

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material

      ☐ a sequence listing

      ☐ table(s) related to the sequence listing

   b. format of material

      ☐ on paper

      ☐ in electronic form

   c. time of filing/furnishing

      ☐ contained in the international application as filed

      ☐ filed together with the international application in electronic form

      ☐ furnished subsequently to this Authority for the purposes of search

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 06/34184

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	NONE	YES
	Claims	1-45	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-45	NO
Industrial applicability (IA)	Claims	1-45	YES
	Claims	NONE	NO

2. Citations and explanations:

Claims 1-45 lack novelty under PCT Article 33(2) as being anticipated by US 5,799,276 A to Komissarchik et al. (hereinafter 'KOMISSARCHIK').

As per claims 1, 16, and 31, KOMISSARCHIK discloses a system for interpreting speech (speech recognition system 10, fig. 1, col 7, ln 47 col 8, ln 39), with a corresponding method (recognition method 30, fig. 3, col 8, ln 46 col 16, ln 24) implemented by computer-executable instructions stored in a computer-readable medium (machine-readable programmed instructions stored in memory 17, fig. 1, col 8, ln 2-3), the system comprising: a device (e.g., microphone 11, fig. 1, col 7, ln 54) that receives a user verbalization (utterances, col 8, ln 48) and generates an electronic signal corresponding to the user verbalization (input signal, col8, ln 49); and a speech interpretation engine (CPU 14 and other peripherals in fig. 1) that receives the electronic signal corresponding to the user verbalization (via sound card 12, col 8, ln 50-56), wherein the speech interpretation engine parses the signal into a plurality of phonemes (a list of phoneme labels with transitions detected, col 10, ln 16-22) and generates at least one interpretation (correct spelling of the input signal utterance, col 16, ln 17-18) of the verbalization based on the plurality of phonemes.

As per claims 2-3, 17-18, and 32-33, KOMISSARCHIK further discloses that the generating the at least one preliminary interpretation (rough split, col 9, ln 25-34) includes traversing an acoustic grammar (e.g., phoneme garlands, col 10, ln 51; and rough rules, col 11, ln 66 col 12, ln 21), which is a phonemic representation (sequence of phoneme split segments, col 10, ln 59) of a speech signal, based on the plurality of phonemes.

As per claims 4-5, 19-20, and 34-35, KOMISSARCHIK further discloses that the acoustic grammar includes a linking element between segments, the linking element being an acoustic element (e.g., unstressed vowel, col 10, ln 65-66 and col 13, ln 45-46) in the speech signal.

As per claims 6, 11, 21, 26, 36, and 41, KOMISSARCHIK further discloses a speech sharpening engine (fine split, step 38, fig. 3, col 10, ln 25-58) configured to revise the at least one interpretation by generating a plurality of candidate interpretations (possible word choices, col 12, ln 61-65) of the verbalization; assign an interpretation score (characteristic points, col 14, ln 1-6) to each candidate interpretation; and select a candidate interpretation with a highest interpretation score (best path, col 14, ln 7-19) as a probable interpretation of the verbalization.

As per claims 7, 12, 22, 27, 37, and 42, KOMISSARCHIK further discloses that the speech sharpening engine is configured to revise the at least one interpretation by applying the at least one interpretation against at least one domain agent (e.g., common triphon construction scheme, col 13, ln 51-63); identifying suspect words and/or phrases (word mapping, col 13, ln 24-29) in the at least one interpretation; identifying a closest phonetic match (matching, col 10, ln 59-61; the best of the candidate word strings, col 15, ln 66-67) for the suspect words and/or phrases based on a relative weighting (col 13, ln 17 col 14, ln 45) of parameters in at least one domain associated with the at least one domain agent; and substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation (candidate word list, col 15, col 13, ln 24-29).

As per claims 8, 13, 23, 28, 38, and 43, KOMISSARCHIK further discloses that the closest phonetic match is stored in an M-Tree (dendrogram with best n hypotheses, col 10, ln 32-41) and identifying the closest phonetic match includes using a closest-distance metric (minimum cost path based on a distance, col 65, ln 39 col 66, ln10) associated with the M-Tree.

As per claims 9, 14, 24, 29, 39, and 44, KOMISSARCHIK further discloses that the parameters include at least one of a context (col 42, ln 27-35) of the verbalization, a verbalization criteria (col 16, ln 1-7), a history of user verbalizations (e.g., statistics, col 14, ln 23-28; histogram of energy distribution, col 17, ln 50), a user profile (e.g., pitch period, col 18, ln 50-54), or domain specific information (e.g., a table of formant values for diphons or triphons, col 13, ln 64-67).

As per claims 10, 15, 25, 30, 40, and 45, KOMISSARCHIK discloses that the speech sharpening engine is further configured to adjust the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization (col 14, ln 13-18).

Claims 1-45 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

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Voicebox Technologies, Inc.
10505 NE 38th Placw, Building 9
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ETATS-UNIS D'AMERIQUE

Date
14.03.08

Reference	Application No./Patent No.
	06814053.2 - 1224 PCT/US2006034184
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Communication pursuant to the Decision of the President of the European Patent Office dated 12 July 2007 on the filing of priority documents (Special edition No. 3, OJ EPO 2007, 22)

Please be informed that the priority document(s) listed below has (have) been included in the file of the above-mentioned European patent application (R. 53(2) EPC). It should be noted that, for technical reasons, this communication may be issued not only if the priority document has been included in the file electronically in accordance with the above-mentioned Decision but also if it was filed by the applicant.

State:	Date of filing:	Application number:
US	31.08.05	USP 712412

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GATTO, James, G. et al.
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Date
11.01.08

Reference	Application No./Patent No.
	06814053.2 - 1224 PCT/US2006034184
Applicant/Proprietor	
Voicebox Technologies, Inc.	

Entry into the European phase before the European Patent Office

The following information describes the procedural steps required for entry into the European phase before the European Patent Office (EPO). You are advised to read it carefully because failure to take the necessary action in due time can lead to a loss of rights.

1. The above mentioned international patent application has been given the **European application No. 06814053.2**.

2. Applicants **without a residence or their principal place of business** in an EPC Contracting State may themselves initiate European processing of their international applications, provided they do so before expiry of the 31st month from the priority date.

   During the European phase before the EPO as designated or elected Office, however, such applicants **must** be represented by a professional representative (Art. 133(2) and Art. 134(1) and (8) EPC).

   Where, at the expiry of the time period laid down in Rule 163(5) EPC, the requirements of Article 133(2) EPC have not been complied with, the European patent application will be **refused**, pursuant to Rule 163(6) EPC.

   Please note that a professional representative authorised to act before the EPO and who acted for the applicant during the international phase does not automatically become the representative for the European phase. Applicants are therefore strongly advised to appoint in good time any representative they wish to initiate the European phase for them; otherwise the EPO has to send all communications directly to the applicant.

3. Applicants **with a residence or their principal place of business** in an EPC Contracting State are not obliged to appoint for the European phase a professional representative authorised to act before the EPO. However, in view of the complexity of the procedure it is recommended that they do so.

4. Applicants and professional representatives are also strongly advised to initiate the European phase using **EPO Form 1200**. It is available free of charge from the EPO or via the EPO website at **http://www.epo.org**. Similarly, it can be or generated with the epoline® Online Filing Software, obtainable free of charge from the EPO (**http://www.epoline.org**) The use of the form is not compulsory.

5. Where the EPO is acting as designated or elected Office (Art. 22(1) and (3) and Art. 39(1) PCT), to enter the European phase before the EPO, the **following acts** must be performed by the applicant **within 31 months** from the date of filing of the international application or (where applicable) the earliest priority date:

   a) Supply a translation of the international application into an EPO official language, if the International Bureau did not publish the application in such language (Art. 22(1) PCT and R. 159(1)(a) EPC);

   b) Specify the application documents, as originally filed or as amended, on which the European grant procedure is to be based (R. 159(1)(c) EPC);

   c) Pay the filing fee and, where a supplementary European search report has to be drawn up, the search fee (R. 159(1)(c) and (e) EPC);

   d) Pay the designation fee for each designated Contracting State if the time limit laid down in Rule 39(1) EPC (i.e. six months after publication of the international search report) has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(d) EPC);

   e) File the request for examination if the time limit laid down in Rule 70(1) EPC (i.e. six months after publication of the international search report) has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(f) EPC);

   f) Pay the renewal fee in respect of the third year, if the fee has fallen due (see Rule 51(1) EPC) before expiry of the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(g) EPC);

   g) File, where applicable, the certificate of exhibition referred to in Article 55(2) and Rule 25 EPC (R. 159(1)(h) EPC);

   h) Pay the claims fees for the eleventh and each subsequent claim when the application documents on which the European grant procedure is to be based comprise more than ten claims (R. 162(1) EPC).

If either the translation of the international application or the request for examination is not filed in due time, or if the filing fee or the search fee is not paid in due time, or no designation fee is paid in due time, the European patent application **shall be deemed to be withdrawn** (R. 160(1) EPC).

If the renewal fee is not paid in due time, it may still be paid within six months of the due date, provided that an additional fee is also paid within that period (R. 51(2) EPC).

If the claims fees are not paid in due time, they may still be paid within one month from a communication of the EPO pointing out the failure to observe the time limit (R. 162(2) EPC).

6. For an overview of search and examination fees, see the Notice from the European Patent Office dated 1 March 2006 (OJ EPO 2006, 192). The amounts of the fees are regularly published in the Official Journal of the EPO and are available on the EPO internet site at **http://www.epo.org**. At any time, payments to the EPO can be validly made by anybody.

7. If the applicant had appointed a representative during the application's international phase, the present Form will be sent to the representative, asking him to inform the applicant accordingly.

   All subsequent communications will be sent to the applicant, or if the EPO is informed of his appointment in time, to the applicant's European representative.

8. For more details about time limits and procedural acts before the EPO as designated or elected Office, see the EPO brochure "How to get an European patent", Guide for applicants - Part 2, PCT procedure before the EPO - "Euro-PCT" (EPO PCT Guide). This brochure, the list of professional representatives before the EPO, Form 1200 and details of the latest fees are available on the Internet under **http://www.epo.org**.

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EPO Customer Services
Tel.: +31 (0)70 340 45 00

Date: 21.11.07

Reference	Application No./Patent No.
	06814053.2 - 1224
Applicant/Proprietor: Voicebox Technologies, Inc.	

The international search report, or the declaration under Article 17(2)(a) PCT, has been published under Article 21(3) and Rule 48 PCT on 15.11.07. That publication takes the place of the mention of publication of the European search report (Art. 157(1) EPC).

The request for examination must be filed within **six months** from the above date (Art. 94(2) in conjunction with Art. 157(1) EPC). It is not deemed to have been filed until the examination fee has been paid. However, under Article 22 or 39 PCT in conjunction with Article150(2) and Rule 107(1) EPC, the time limit for filing it does not expire before the end of the 31st month from the filing date (or earliest priority date). Payment of the designation fees must also be made within the above-mentioned period (R. 107(1) EPC). The same applies also for the extension fees.

If the request for examination is not filed in due time, and at least one designation fee is not paid, the European patent application is deemed to be withdrawn (Art. 94(3), 79(3) and R. 108(1) EPC).

For more details see the Guide for applicants Part 2: PCT proceedings before the EPO-"Euro-PCT".

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If the request for examination is not filed in due time, and at least one designation fee is not paid, the European patent application is deemed to be withdrawn (Art. 94(3), 79(3) and R. 108(1) EPC).

For more details see the Guide for applicants Part 2: PCT proceedings before the EPO-"Euro-PCT".

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 06/34184

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8): G10L 15/18 (2007.01)
USPC: 704/257
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC: 704/257

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 704/200

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST(PGPB,USPT,USOC,EPAB,JPAB), GOOGLE SCHOLAR - terms: speech recognition, adjust or adapt, weight, phoneme or phonetic, M-tree

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,799,276 A (KOMISSARCHIK et al.) 25 August 1998 (25.08.1998), entire document.	1-45
A	US 6,501,833 B2 (Phillips et al.) 31 December 2002 (31.12.2002), entire document.	1-45

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 May 2007 (03.05.2007)	24 AUG 2007
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2005)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 March 2007 (08.03.2007)

PCT

(10) International Publication Number
WO 2007/027989 A3

(51) International Patent Classification:
G10L 15/18 (2006.01)

(21) International Application Number:
PCT/US2006/034184

(22) International Filing Date: 31 August 2006 (31.08.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/712,412 31 August 2005 (31.08.2005) US

(71) Applicant *(for all designated States except US)*: **VOICEBOX TECHNOLOGIES, INC.** [US/US]; 10505 NE 38th Place, Building 9, Kirkland, WA 98033 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DI CRISTO, Philippe** [FR/US]; 177 107th Avenue, N.E., #1007, Bellevue, WA 98004 (US). **KE, Min** [US/US]; 3221 201st Place, S.E., Bothell, WA 98012 (US). **KENNEWICK, Robert, A.** [US/US]; 2204 S. Eddy St., Seattle, WA 98108 (US). **TJALVE, Michael** [DK/US]; 14904 SE 47th Court, Bellevue, WA 98006 (US).

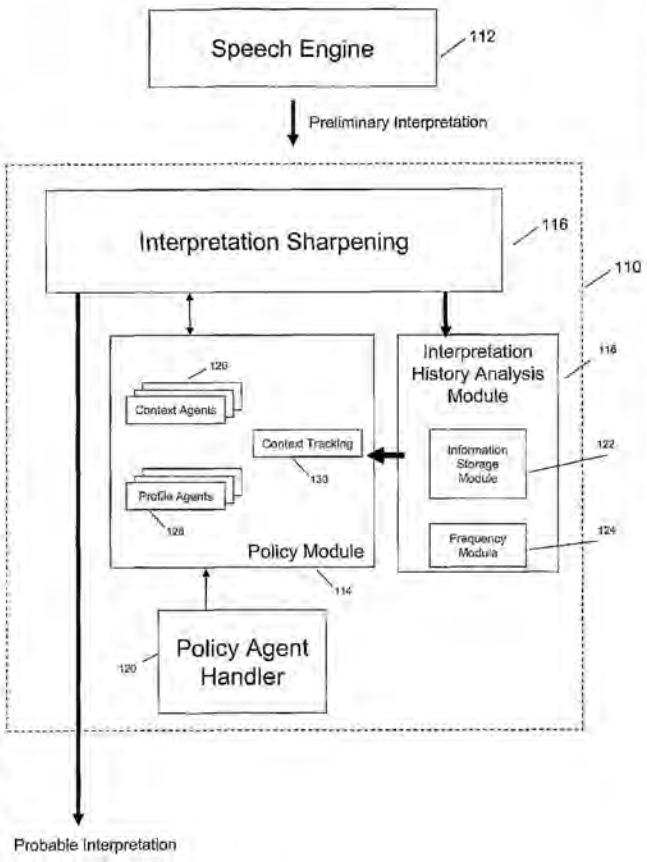
(74) Agents: **GATTO, James, G.** et al.; PILLSBURY WINTHROP SHAW PITTMAN LLP, P.O. Box 10500, Mclean, VA 22102 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: DYNAMIC SPEECH SHARPENING



(57) Abstract: An enhanced system for speech interpretation is provided. The system may include receiving a user verbalization and generating one or more preliminary interpretations of the verbalization by identifying one or more phonemes in the verbalization. An acoustic grammar may be used to map the phonemes to syllables or words, and the acoustic grammar may include one or more linking elements to reduce a search space associated with the grammar. The preliminary interpretations may be subject to various post-processing techniques to sharpen accuracy of the preliminary interpretation. A heuristic model may assign weights to various parameters based on a context, a user profile, or other domain knowledge. A probable interpretation may be identified based on a confidence score for each of a set of candidate interpretations generated by the heuristic model. The model may be augmented or updated based on various information associated with the interpretation of the verbalization.

WO 2007/027989 A3

FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
15 November 2007

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US2006/034184

International filing date: 31 August 2006 (31.08.2006)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/712,412
Filing date: 31 August 2005 (31.08.2005)

Date of receipt at the International Bureau: 13 November 2006 (13.11.2006)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1539500

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

November 06, 2006

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: *60/712,412*
FILING DATE: *August 31, 2005*
RELATED PCT APPLICATION NUMBER: *PCT/US06/34184*

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. _____

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
ROBERT A.	KENNEWICK	Seattle, WA

Additional inventors are being named on the _____ *separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

DYNAMIC SPEECH SHARPENING

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

[X] The address corresponding to Customer Number: 00909

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ENCLOSED APPLICATION PARTS *(check all that apply)*

[X] Application Data Sheet. See 37 CFR 1.76

[X] Specification *Number of Pages* 13

[X] Drawing(s) *Number of Sheets* 3

[ ] CD(s), Number _____

[ ] Other (specify) _____

Application Size Fee: If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[X] No.

[ ] Yes, the name of the U.S. Government agency and the Government contract number are: _____

SIGNATURE _____

Date August 31, 2005

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REGISTRATION NO. 48,283 *(If appropriate)*

Docket Number: 090611-0312471

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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DYNAMIC SPEECH SHARPENING

FIELD OF THE INVENTION

The invention is related to enhancing automated speech interpretation.

BACKGROUND OF THE INVENTION

The field of automated speech interpretation is in increasingly higher demand. One use of automated speech interpretation is as an input for electronic devices. This may enable a user to simply speak to an electronic device rather than inputting commands, or other information, manually, by uploading, or by other input methods. Controlling various electronic devices through speech may enable the user to use the electronic devices more efficiently.

However, existing technology in the field of automated speech interpretation, such as standard speech engines and other devices, are not able to interpret natural human speech with a suitable accuracy to sufficiently control some electronic devices. Shortcomings in accuracy may have many causes, including poor microphones, extraneous noises, unclear speech by the user, an accent of the user, a quality of standard search engines, and other causes.

In light of these and other problems, there is a need for enhanced automated speech interpretation that may interpret natural human speech with an augmented accuracy.

SUMMARY

One aspect of the invention may relate to a system for enhancing automated speech interpretation. The system may be used to sharpen a speech interpretation made by a speech engine. The system may be modeled at least partially after one or more speech pattern recognition techniques used by humans. A speech pattern recognition technique may include interpreting speech using words, a word sequence, a word combination, a word position, a context, a phonetic similarity between two or more words, a part of speech, or other techniques.

In some embodiments of the invention, the system may receive information related to a verbalization made by a user. The system may receive this information from a speech engine. The information may include textual information, or other information, that may represent a plurality of preliminary interpretations of the verbalization made by the user. The plurality of preliminary interpretations may be arranged in a predetermined form, such as an array, a matrix, or other forms.

According to various aspects of the invention, the system may include a policy module. The policy module may manage and/or provide one or more policies that may enable the system to designate one of the preliminary interpretations as a probable interpretation of the verbalization made by the user. A policy may include one or more policy parameters for distinguishing between the preliminary interpretations to designate a probable interpretation. A policy parameter may include a policy vocabulary, a word position in the verbalization, a word combination, a sentence structure, or other parameters. A policy may include a parameter weighting scheme. The parameter weighting scheme may weight individual policy parameters according to one or more weighting factors, such as, a frequency of use, a difficulty to understand, or other factors.

The policy module may include a profile policy sub-module. The profile policy sub-module may manage and/or provide one or more profile policies. A profile policy may correspond to a user. The profile policy may include one or more profile policy parameters that may be tailored to the user. The profile policy may be used as a base policy in interpreting any verbalizations made by the user. The profile policy may be augmented to enable the system to provide more accurate interpretations of verbalizations made by the user. The augmentation may include a user provided augmentation, such as, providing additional vocabulary (e.g. the names in an address book, etc.), providing a personalized pronunciation, or other user provided augmentations. The augmentation may include a non-user provided augmentation, such as, updates generated by a third party (e.g. a commercial administration and/or maintenance entity), or other non-user provided augmentations. The augmentation may include an automated

augmentation, such as alterations made to a profile parameter weighting scheme in an automated manner due to past speech patterns of the user, or other automated augmentations. Other augmentations may be made.

The policy module may include a context policy sub-module. The context policy sub-module may manage and/or provide one or more context policies. A context policy may include one or more context policy parameters that may be tailored to a verbalization context. The context policy may enhance an ability of the system related to interpreting verbalizations made by the user in the verbalization context corresponding to the context policy. A context policy may be augmented to enable the system to provide more accurate interpretations of verbalizations made in a verbalization context corresponding the context policy. The augmentation may include a user provided augmentation, a non-user provided augmentation, an automated augmentation, or other augmentations.

According to various embodiments of the invention, the policy module may include a context tracking sub-module. The context tracking sub-module may track the verbalization context of a consecutive series of verbalizations by the user. The context tracking sub-module may utilize one or more conversation trees to track the series of verbalizations. The context tracking sub-module may track one or more past verbalization contexts of the series of verbalizations, may track one or more current verbalization contexts of the series of verbalizations, and/or may make predictions regarding one or more future verbalization contexts of the series of verbalizations. The policy module may utilize information about the verbalization context of the series of verbalizations generated by the context tracking sub-module to manage and/or provide one or more context policies.

In some embodiments of the invention, the system may include an interpretation sharpening module. The interpretation sharpening module may generate a probable interpretation of a verbalization made by a user. The interpretation sharpening module may generate the probable interpretation based at least in part on a plurality of preliminary interpretations of the verbalization and one or more policies. The plurality of preliminary interpretations may be provided by the speech engine. The policies may be provided by the policy module.

The interpretation sharpening module may apply one or more policies, such as, one or more context policies and/or a profile policy, to the preliminary interpretations to generate one or more interpretation scores. An interpretation score may be related to the likelihood of a particular preliminary interpretation being a correct interpretation of the verbalization. The preliminary interpretation corresponding to the highest (or lowest) interpretation score may then be designated as a probable interpretation of the verbalization.

According to various embodiments of the invention, the system may include an interpretation history analysis module. The interpretation history analysis module may enable the system to augment one or more policies based on an analysis of past interpretations related to previously interpreted vocalizations. The augmentations enabled by the interpretation history analysis module may include an automated augmentation, or other augmentations.

The interpretation history analysis module may include an information storage sub-module. The information storage sub-module may store interpretation information related to past verbalizations, such as, one or more preliminary interpretations associated with a past verbalization, one or more interpretation scores associated with a past verbalization, one or more probable interpretations associated with a past verbalization, whether or not a past verbalization was interpreted correctly, or other information.

The interpretation history analysis module may include a frequency sub-module. The frequency sub-module may use some or all of the information stored in the information storage sub-module to generate one or more frequencies related to one or more past verbalizations. For example, the frequency sub-module may calculate a word usage frequency, a word combination frequency, a frequency related to a set of verbalizations that are phonetically similar but have distinct meanings, an interpretation error frequency for a particular verbalization, or other frequencies.

Information stored and/or generated by the interpretation history analysis module may be used to augment the system. In some embodiments, one or more frequencies generated may be used to augment one or more policies. For

example, one or more policy parameters and/or a policy weighting scheme of a policy may be augmented based on a frequency generated by the interpretation history analysis module. Other augmentations using information stored and/or generated by the interpretation history analysis module may be made.

In some embodiments of the invention, the system may include a policy agent handler. The policy agent handler may augment, update, remove, and/or provide one or more policy agents to the system. A policy agent may include one or more context policies. The policy agent handler may be controlled, directly or indirectly, by a third party (e.g. a commercial entity, etc.). The policy agent handler may augment, update, remove, and/or provide the policy agents to the system as part of a commercial agreement, such as a licensing agreement, a subscription agreement, a maintenance agreement, or other agreements.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an exemplary embodiment of a system for enhancing automated speech interpretation.

FIG. 2 illustrates an exemplary embodiment of a system for enhancing automated speech interpretation.

FIG. 3 illustrates a flow chart of an exemplary embodiment of a method for enhancing automated speech interpretation.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an exemplary embodiment of a system 110 for enhancing automated speech interpretation. System 110 may receive information related to a verbalization made by a user. System 110 may receive this information from a speech engine 112. The information may include textual information, or other information, that may represent a plurality of preliminary interpretations of the verbalization. The plurality of preliminary interpretations may be arranged in a predetermined form, such as an array, a matrix, or other forms.

According to various aspects of the invention, system 110 may include a policy module 114. Policy module 114 may manage and/or provide one or more policies that may enable system 110 to designate one of the preliminary interpretations as a probable interpretation of the verbalization. A policy may include one or more policy parameters for distinguishing between the preliminary interpretations to designate a probable interpretation. A policy parameter may include a policy vocabulary, a word position in the verbalization, a word combination, a sentence structure, or other parameters. A policy may include a parameter weighting scheme. The parameter weighting scheme may weight individual policy parameters according to one or more weighting factors, such as, a frequency of use, a difficulty to understand, or other factors.

In some embodiments of the invention, system 110 may include an interpretation sharpening module 116. Interpretation sharpening module 116 may generate a probable interpretation of the verbalization. Interpretation sharpening module 116 may generate the probable interpretation based at least in part on the plurality of preliminary interpretations. The policies may be provided by policy module 114.

According to various embodiments of the invention, system 110 may include an interpretation history analysis module 118. Interpretation history analysis module 118 may enable system 110 to augment one or more policies based on an analysis of past interpretations related to previously interpreted vocalizations. The augmentations enabled by interpretation history analysis module 118 may include an automated augmentation, or other augmentations.

In some embodiments of the invention, system 110 may include a policy agent handler 120. Policy agent handler 120 may augment, update, remove, and/or provide one or more policy agents to system 110. A policy agent may include one or more context policies

FIG. 2 illustrates an exemplary embodiment of system 110 including policy module 114. Policy module 114 may include a profile policy sub-module 210. Profile policy sub-module 210 may manage and/or provide one or more profile policies. A profile policy may correspond to a user. The profile policy may

include one or more profile policy parameters that may be tailored to the user. The profile policy may be used as a base policy in interpreting any verbalizations made by the user. Profile policy sub-module 210 may enable an augmentation of the profile policy. Augmentation of the profile policy may enable system 110 to provide more accurate interpretations of verbalizations made by the user. An augmentation may include a user provided augmentation, such as, providing additional vocabulary (e.g. the names in an address book, etc.), providing a personalized pronunciation, or other user provided augmentations. An augmentation may include a non-user provided augmentation, such as, updates generated by a third party (e.g. a commercial administration and/or maintenance entity), or other non-user provided augmentations. An augmentation may include an automated augmentation, such as alterations made to a profile parameter weighting scheme in an automated manner due to past speech patterns of the user, or other automated augmentations. Other augmentations may be made.

Policy module 114 may include a context policy sub-module 212. Context policy sub-module 212 may manage and/or provide one or more context policies. A context policy may include one or more context policy parameters that may be tailored to a verbalization context. The context policy may enhance an ability of the system related to interpreting verbalizations made by the user in the verbalization context corresponding to the context policy. Context policy sub-module 212 may enable an augmentation of a context policy. Augmentation of a context policy may enable system 110 to provide more accurate interpretations of verbalizations made in a verbalization context corresponding the context policy. An augmentation may include a user provided augmentation, a non-user provided augmentation, an automated augmentation, or other augmentations.

According to various embodiments of the invention, policy module 114 may include a context tracking sub-module 214. Context tracking sub-module 214 may track the verbalization context of a consecutive series of verbalizations by the user. Context tracking sub-module 214 may utilize one or more conversation trees to track the series of verbalizations. Context tracking sub-module 214 may track one or more past verbalization contexts of the series of

verbalizations, may track one or more current verbalization contexts of the series of verbalizations, and/or may make predictions regarding one or more future verbalization contexts of the series of verbalizations. Policy module 114 may utilize information about the verbalization context, generated by context tracking sub-module 214, to manage and/or provide one or more context policies.

In some embodiments, interpretation sharpening module 116 may apply one or more policies to the preliminary interpretations provided by speech engine 112. The policies may include one or more context policies, a profile policy, or other policies. The policies may be provided by policy module 114. Applying the policies to the preliminary interpretations may generate one or more interpretation scores. An interpretation score may be related to the likelihood of a particular preliminary interpretation being a correct interpretation of the verbalization. The preliminary interpretation corresponding to the highest (or lowest) interpretation score may then be designated by interpretation sharpening module 116 as a probable interpretation of the verbalization.

According to various embodiments of the invention, interpretation history analysis module 118 may include an information storage sub-module 216. Information storage sub-module 216 may store interpretation information related to past verbalizations, such as, one or more preliminary interpretations associated with a past verbalization, one or more interpretation scores associated with a past verbalization, one or more probable interpretations associated with a past verbalization, whether or not a past verbalization was interpreted correctly, or other information.

Interpretation history analysis module 118 may include a frequency sub-module 218. Frequency sub-module 218 may use some or all of the information stored in information storage sub-module 216 to generate one or more frequencies related to one or more past verbalizations. For example, frequency sub-module 218 may calculate a word usage frequency, a word combination frequency, a frequency related to a set of verbalizations that are phonetically similar but have distinct meanings, an interpretation error frequency for a particular verbalization, or other frequencies.

Information stored and/or generated by interpretation history analysis module 118 may be used to augment system 110. In some embodiments, one or more frequencies generated, may be used to augment one or more policies. For example, one or more policy parameters and/or a policy weighting scheme of a policy may be augmented based on a frequency generated by interpretation history analysis module 118. Other augmentations related to information stored on and/or generated by interpretation history analysis module 118 may be made.

Policy agent handler 120 may augment, update, remove, and/or provide one or more policy agents to system 110. A policy agent may include one or more context policies. Policy agent handler 120 may be controlled, directly or indirectly, by a third party (e.g. a commercial entity, etc.). Policy agent handler 120 may augment, update, remove, and/or provide the policy agents to system 110 as part of a commercial agreement, such as a licensing agreement, a subscription agreement, a maintenance agreement, or other agreements.

FIG. 3 illustrates a flow chart of an exemplary embodiment of a method 310 for enhancing automated speech interpretation. Method 310 may include a verbalization operation 312. At verbalization operation 312 a verbalization of a user may be electronically captured. The verbalization may be captured by a microphone or other electronic audio capture device.

According to various embodiments of the invention, method 310 may include a preliminary interpretation operation 314. At preliminary interpretation operation 314 one or more preliminary interpretations of the verbalization may be made. The preliminary interpretations may be represented in a textual format, or otherwise represented. The preliminary interpretations may be arranged in a predetermined form, such as, an array, a matrix, or other forms. Preliminary interpretation operation 314 may be performed by speech engine 112.

The preliminary interpretations may be provided to system 110 at a provide preliminary interpretations operation 316. The preliminary interpretations may be received in system 110 by interpretation sharpening module 116.

In some embodiments of the invention, method 310 may include a provide policies operation 318. Provide policies operation 318 may be performed

concurrently with provide preliminary interpretations operation 316. At provide policies operation 318 one or more policies may be selected and/or provided to system 110. The policies selected and/or provided may include a profile policy, a context policy, or other policies. The policies may be selected and/or provided by policy module 114. The policies may be provided to interpretation sharpening module 116.

At an apply policies operation 320, one or more policies may be applied to the preliminary interpretations. The policies applied to the preliminary interpretations may include the policies provided at provide policies operation 318, or other policies. Applying the policies to the preliminary interpretations may generate one or more interpretation scores. An interpretation score may be related to a likelihood of a particular preliminary interpretation being a correct interpretation of the verbalization. The policies may be applied to the preliminary interpretations by interpretation sharpening module 116.

According to various embodiments of the invention, at a determine probable interpretation operation 322 a highest (or lowest) interpretation score may be determined, and a preliminary interpretation corresponding to the highest (or lowest) interpretation score may be designated as a probable interpretation. The probable interpretation may represent an enhanced interpretation of the verbalization of the user. Determine probable interpretation operation 322 may be performed by interpretation sharpening module 116.

Method 310 may include a store interpretation information operation 324. At store interpretation information operation 324, system 110 may store interpretation information related to the verbalization. Interpretation information may include one or more preliminary interpretations associated with a past verbalization, one or more interpretation scores associated with a past verbalization, one or more probable interpretations associated with the verbalization, whether or not the verbalization was interpreted correctly, or other information. The interpretation information may be stored at interpretation history analysis module 118.

In some embodiments of the invention, some or all of the interpretation information stored at store interpretation information operation 324 may be used to determine one or more frequencies at a determine frequencies operation 326. The frequencies calculated at determine frequencies operation 326 may include one or more frequencies related to past verbalizations, such as, a word usage frequency, a word combination frequency, a frequency related to a set of verbalizations that are phonetically similar but have distinct meanings, an interpretation error frequency for a particular verbalization, or other frequencies. Determine frequencies operation 326 may be performed by interpretation history analysis module 118.

In various embodiment, system 110 may decide whether an augmentation may be made at an augmentation decision operation 328. The decision concerning system augmentation may be based at least in part on information generated at determine frequencies block 326, such as one or more frequencies, or other information. If system 110 decides that augmentation may not be made, no further action is taken until another verbalization is captured.

In some instances, system 110 may determine that augmentation may be made and control of system 110 may transfer to an augment system operation 330. Augment system operation 330 may include making an augmentation to system 110. For example, one or more policies may be augmented in accordance with information generated by determine frequencies operation 326. The policies augmented may include a context policy, a profile policy, or other policies.

What is claimed is:

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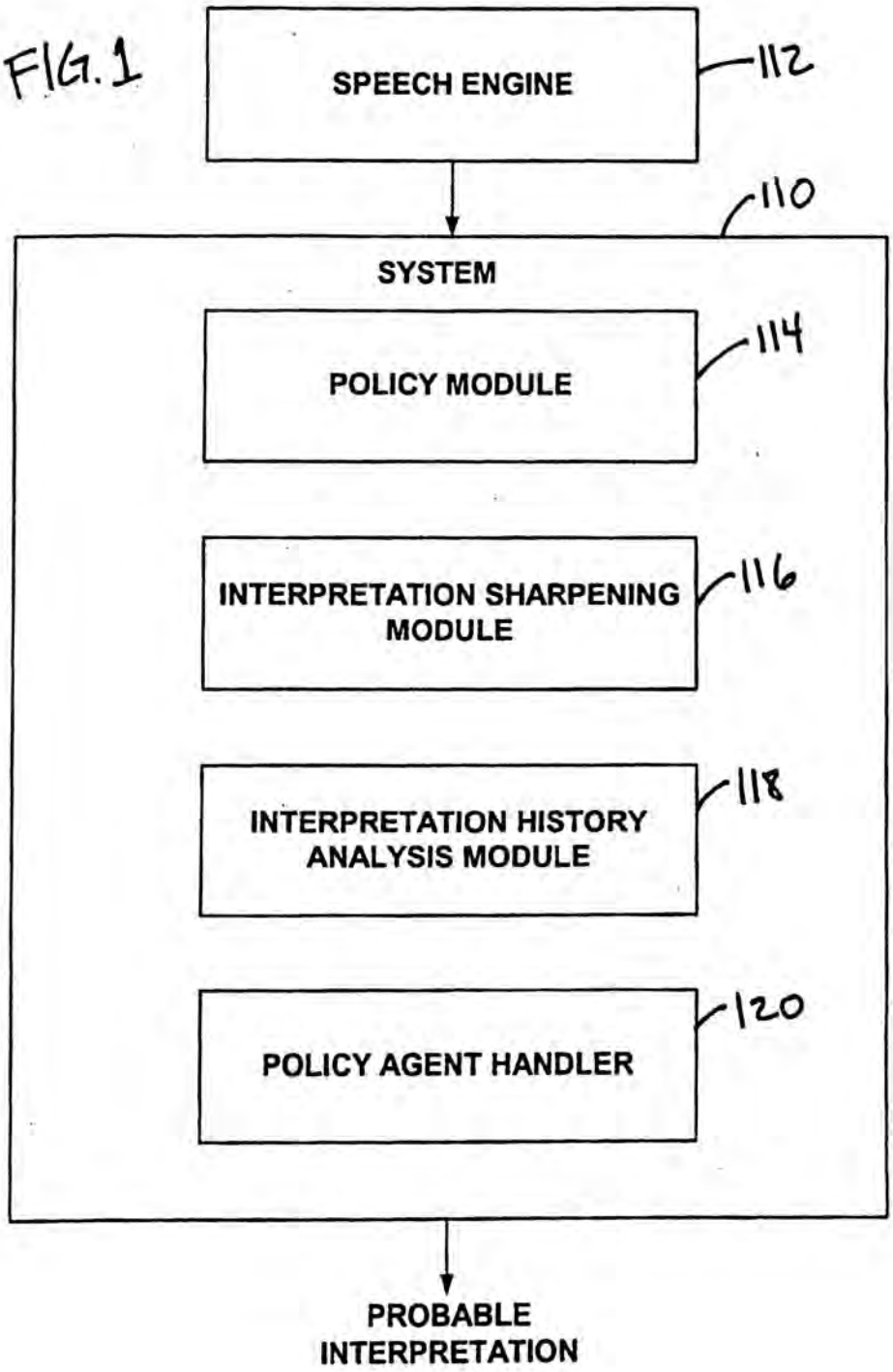
ABSTRACT

A system and method for enhancing automated speech interpretation. The system and method may be used to sharpen a speech interpretation made by a speech engine. The system and method may be modeled at least partially after speech pattern recognition techniques used by humans. A speech pattern recognition technique may include interpreting speech using words, a word sequence, a word combination, a word position, a context, a phonetic similarity between two or more words, a part of speech, or other techniques. In some embodiments of the invention, the system and method may include receiving information related to a verbalization made by a user. This information may be received from a speech engine. The information may include textual information, or other information, that may represent a plurality of preliminary interpretations of the verbalization made by the user.

FIG. 1



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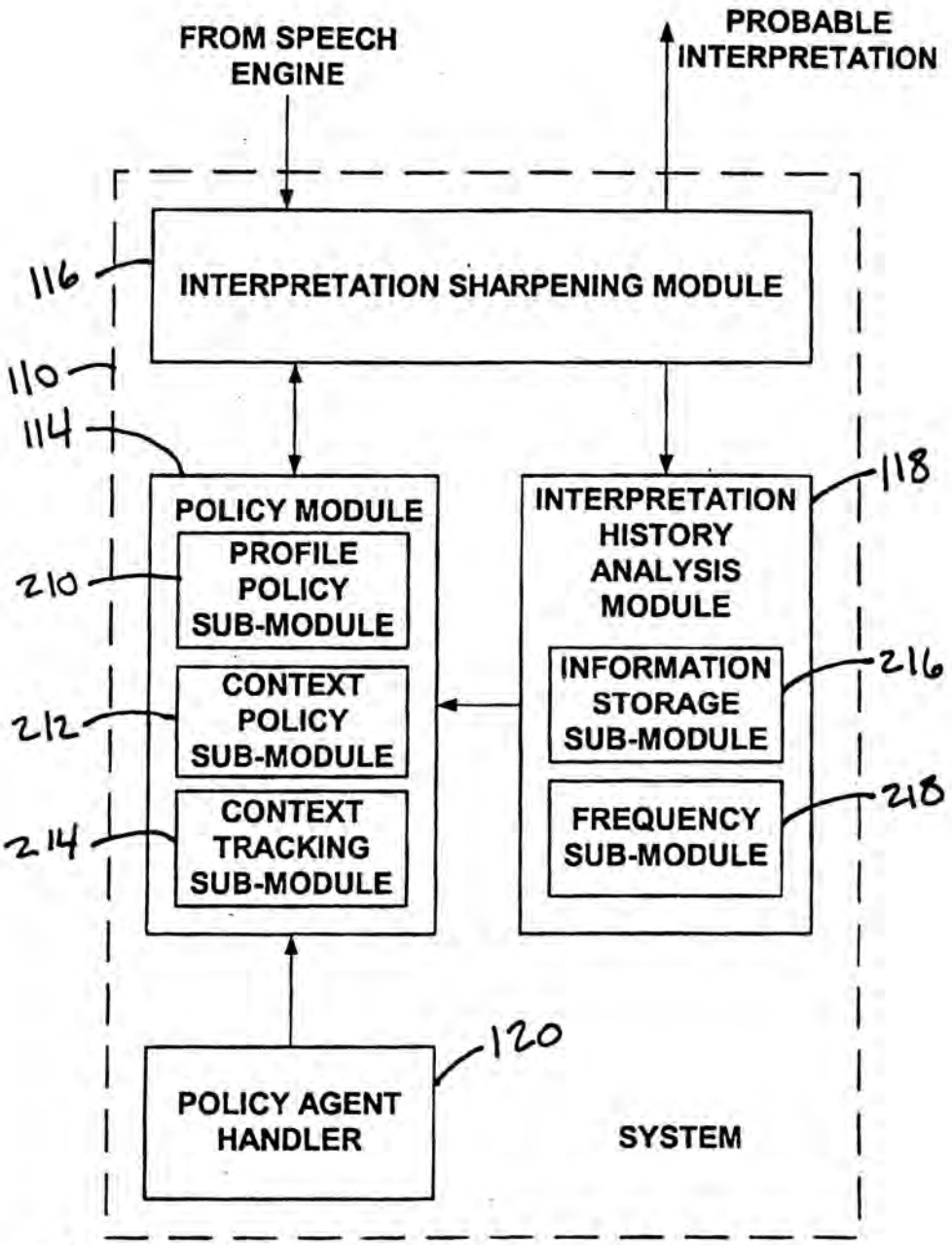

FIG. 2

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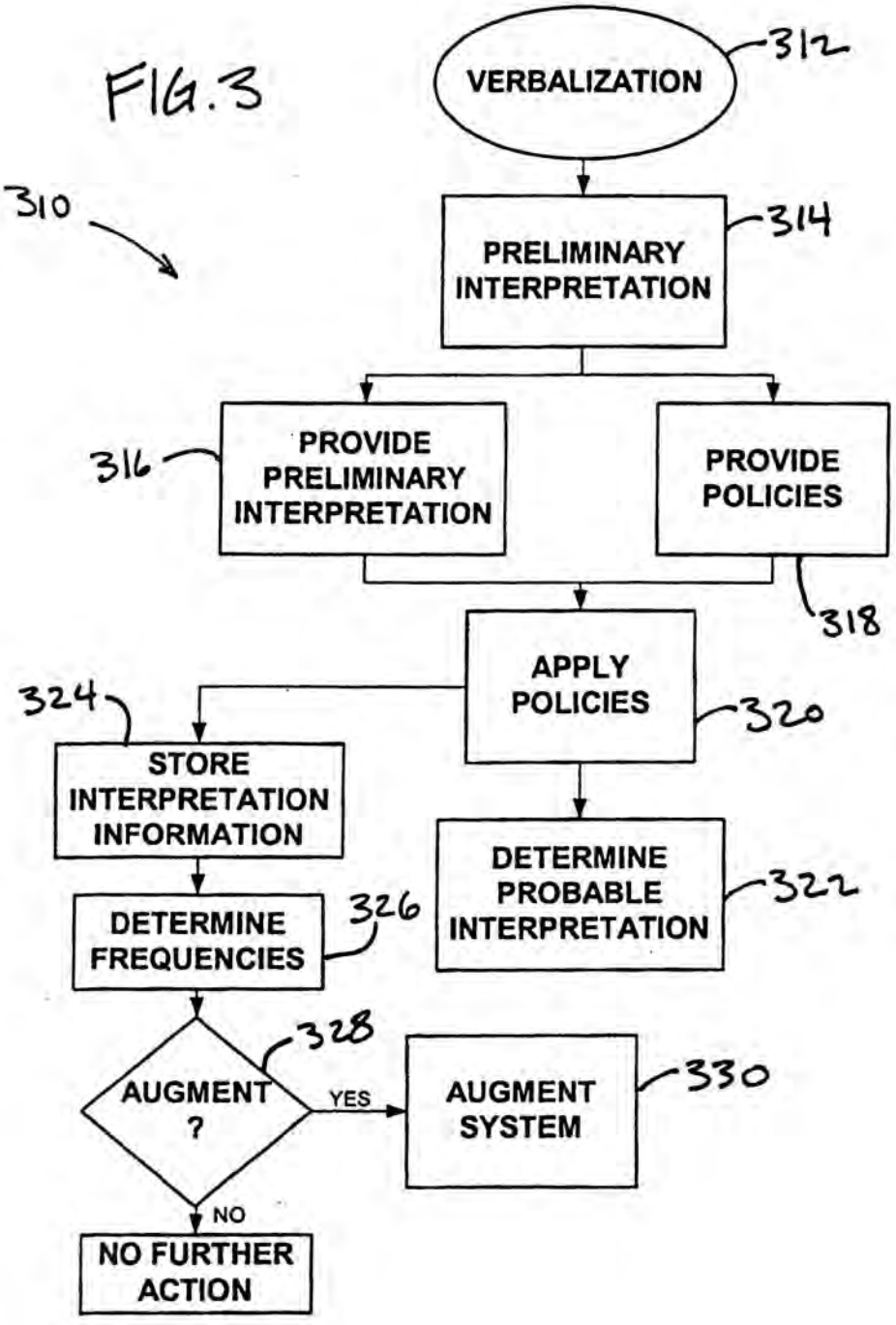
FIG.3



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: ROBERT A. KENNEWICK

Application No.: TBD

Filed: August 31, 2005

For: DYNAMIC SPEECH SHARPENING

Commissioner for Patents
P.O. Box 1450
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APPLICATION DATA SHEET
37 C.F.R. § 1.76

BIBLIOGRAPHIC DATA

1. **Applicant information**

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3. **Application information**

   Title of Invention: DYNAMIC SPEECH SHARPENING

   Docket number assigned to this application: 090611-0312471
   Suggested Classification: Class:
   Subclass:
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   Total number of drawing sheets: 3
   Type of application: Provisional

Secrecy order under § 5.2:

This application does not disclose subject matter of an application which is under a secrecy order pursuant to § 5.2.

4. Representative information

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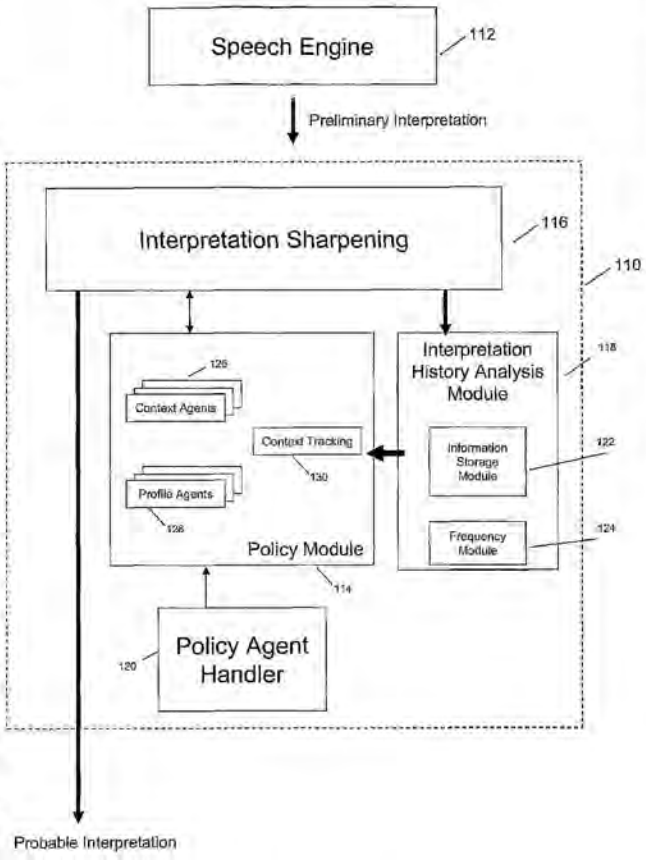
(54) Title: DYNAMIC SPEECH SHARPENING



(57) Abstract: An enhanced system for speech interpretation is provided. The system may include receiving a user verbalization and generating one or more preliminary interpretations of the verbalization by identifying one or more phonemes in the verbalization. An acoustic grammar may be used to map the phonemes to syllables or words, and the acoustic grammar may include one or more linking elements to reduce a search space associated with the grammar. The preliminary interpretations may be subject to various post-processing techniques to sharpen accuracy of the preliminary interpretation. A heuristic model may assign weights to various parameters based on a context, a user profile, or other domain knowledge. A probable interpretation may be identified based on a confidence score for each of a set of candidate interpretations generated by the heuristic model. The model may be augmented or updated based on various information associated with the interpretation of the verbalization.

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DYNAMIC SPEECH SHARPENING

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims the benefit of provisional U.S. Patent Application Serial No. 60/712,412, entitled "Dynamic Speech Sharpening," filed August 31, 2005, and which is hereby incorporated by reference in its entirety.

[002] This application is related to the following co-pending applications, which are hereby incorporated by reference in their entirety: "Systems and Methods for Responding to Natural Language Speech Utterance," Ser. No. 10/452,147, filed June 3, 2003, and published as US Patent Application Publication No. US 2004/0044516; "Mobile Systems and Methods for Responding to Natural Language Speech Utterance," Ser. No. 10/618,633, filed July 15, 2003, and published as US Patent Application Publication No. US 2004/0193420; "Systems and Methods for Responding to Natural Language Speech Utterance," Ser. No. 11/197,504, filed August 5, 2005; "System and Method of Supporting Adaptive Misrecognition in Conversational Speech," Ser. No. 11/200,164, filed August 10, 2005; and "Mobile Systems and Methods of Supporting Natural Language Human-Machine Interactions," Ser. No. 11/212,693, filed August 29, 2005.

FIELD OF THE INVENTION

[003] The invention is related generally to automated speech interpretation, and in particular, to enhancing the accuracy and performance of speech interpretation engines.

BACKGROUND OF THE INVENTION

[004] The field of automated speech interpretation is in increasingly higher demand. One use of automated speech interpretation is to provide voice requests to electronic devices. This may enable a user to simply speak to an electronic device rather than manually inputting requests, or other information, through pressing buttons, uploading information, or by other request input methods. Controlling various electronic devices through speech may enable the user to use the electronic devices more efficiently.

[005] However, existing technology in the field of automated speech interpretation, such as standard speech engines, automatic speech recognition (ASR), and other systems for interpreting speech, are unable to process a speech signal in an efficient manner, often constructing large grammars that include a large number of items,

nodes, and transitions, which is a concern particularly for large-list recognition for embedded applications. If the grammar for an embedded application grows too much, it may not fit within the constrained space of an embedded application. With limited CPU power, response time and performance is easily affected due to the significant time needed to compile and load the grammar. Response time is further degraded because the speech engine has to parse through a large number of transition states to come up with a recognition result. Even when the speech engine is able recognize a word, the results are often unreliable because large grammars introduce greater risk of confusion between items as the size of the grammar increases. Existing techniques focus on reducing the size of a grammar tree by removing command variants or criteria items, but this approach strips functionality from the application.

[006] In addition to the performance problems associated with speech recognition engines that employ large word grammars, existing speech processing engines are unable to interpret natural human speech with a suitable accuracy to sufficiently control some electronic devices. In particular, speech interpretation engines still have substantial problems with accuracy and interpreting words that are not defined in a predetermined vocabulary or grammar context. Poor quality microphones, extraneous noises, unclear or grammatically incorrect speech by the user, or an accent of the user may also cause shortcomings in accuracy, such as when a particular sound cannot be mapped to a word in the grammar.

[007] In light of these and other problems, there is a need for enhanced automated speech interpretation that may interpret natural human speech with an augmented accuracy.

SUMMARY OF THE INVENTION

[008] According to one aspect of the invention, a system for enhancing automated speech interpretation is provided. The system may include a set of techniques for use in a speech-to-text engine to enhance accuracy and performance, for example, by reducing the search space of the speech engine. The problems with large-list recognition for embedded applications may also be improved by using phonetic dictation, which may recognize a phoneme string by disregarding the notion of words. The system may also use one or more post-processing techniques to sharpen an output of a preliminary speech interpretation made by a speech engine. The system may be modeled at least partially after one or more speech pattern

recognition techniques used by humans, such as interpreting speech using words, word sequences, word combinations, word positions, context, phonetic similarities between two or more words, parts of speech, or other techniques.

[009] In one implementation of the invention, the system may receive a verbalization made by a user, where a speech engine may receive the verbalization. The speech engine may output information relating to a plurality of preliminary interpretations of the verbalization, where the plurality of preliminary interpretations represent a set of best guesses at the user verbalization. According to one aspect of the invention, the performance of the speech engine may be improved by using phoneme recognition. Phoneme recognition may disregard the notion of words, instead interpreting a verbalization as a series of phonemes, which may provide out-of-vocabulary (OOV) capabilities, such as when a user misspeaks or an electronic capture devices drops part of a speech signal, or for large-list applications, such as city and street names or song titles, for example. Phoneme recognition may be based on any suitable acoustic grammar that maps a speech signal into a phonemic representation. For example, the English language may be broken down into a detailed grammar of the phonotactic rules of the English language. Portions of a word may be represented by a syllable, which may be further broken down into core components of an onset, a nucleus, and a coda, which may be further broken down into sub-categories. Various different acoustic grammars may be formed as trees with various branches representing many different syllables forming a speech signal.

[010] According to another aspect of the invention, the performance of the speech engine and the phonemic recognition may be improved by pruning the search space used by the speech engine using a common phonetic marker. In one implementation, the acoustic grammar may be represented entirely by a loop of phonemes. In another implementation, the speech engine may reduce the search space by reducing the number of transitions in a grammar tree, thereby speeding up the process of compiling, loading, and executing the speech engine. For example, the phoneme loop may include a linking element between transitions. This may reduce the number of grammar transitions, such that grammar paths merge after a first transition and diverge after the linking element. In one implementation of the invention, a common acoustic element that is part of a speech signal may be used as the linking element. In one implementation of the invention, the acoustic element may be one that is very likely to be triggered even if it is unpronounced. For

example, a *schwa* in the English language may be used as the linking element because *schwa* represents an unstressed, central vowel that is likely to be spoken even if unintended. Those skilled in the art will appreciate that acoustic models for different languages may use other frequently elided phonemes as linking elements to reduce the search space used by the speech engine.

[011] The speech engine may generate a plurality of preliminary interpretations representing a set of best guesses at the user verbalization. The preliminary interpretations may be stored in a matrix, array, or another form, and may be provided to an interpretation sharpening module to determine a probable interpretation of a verbalization made by a user by applying heuristic policies against the preliminary interpretation to identify dominant words and/or phrases. According to various aspects of the invention, the interpretation sharpening module may include a policy module that may manage and/or provide one or more policies that enable the sharpening module to generate a plurality of probable interpretations of the verbalization made by the user. For example, according to one aspect of the invention, the plurality of preliminary interpretations may be applied against one or more policies to generate a set of hypotheses as to a candidate recognition. Each hypothesis may be reanalyzed to generate an interpretation score that may relate to a likelihood of the probable interpretation being a correct interpretation of the verbalization, and the preliminary interpretation corresponding to the highest (or lowest) interpretation score may then be designated as a probable interpretation of the verbalization. The designated probable interpretation may be stored and used for augmenting the policies to improve accuracy.

[012] According to one aspect of the invention, the policy module may include one or more agents that represent domains of knowledge. The agents may compete using a weighted model to revise a preliminary interpretation by determining context and intent. Relevant substitution of suspect words and phrases may be based on phonetic similarities or domain appropriateness. A domain agent may include one or more domain parameters for determining a probable interpretation from a preliminary interpretation. For example, domain parameters may include a policy vocabulary, a word position in the verbalization, a word combination, a sentence structure, or other parameters. A domain agent may include a parameter weighting scheme that may weight individual parameters according to one or more weighting factors, such as, a frequency of use, a difficulty to understand, or other factors.

[013] According to one aspect of the invention, the domain agents may revise a preliminary interpretation into a probable interpretation using phonetic fuzzy matching (PFM). In one implementation of the invention, the speech engine may output a phoneme stream that is applied against a model of phoneme feature similarities, drawn from domain agents, to identify a closest phonetic match using a multi-pass method. Domain agents may be loaded and prioritized into an M-Tree, which accounts for the possibility of the speech engine dropping or adding phonemes. An M-Tree may be an index structure that resolves similarity queries between phonemes using a closest-distance metric based on relative weightings of phoneme misrecognition, phoneme addition, and phoneme deletion. The M-Tree may be updated using an adaptive misrecognition model. For example, information about a verbalization and its components, as well as a probability that the probable interpretation was correct, may be stored and used for adapting the policy module for the user.

[014] In one implementation of the invention, the domain agents in the policy module may include one or more profile agents that may manage and/or provide one or more profile policies for revising a preliminary interpretation of a phoneme stream. For example, a profile agent may correspond to a user and may include one or more profile parameters tailored to the user. The profile agent may be used as a base policy to interpret any verbalizations made by the user. In other implementations, a profile agent may correspond to a particular language, a regional accent, or other profiles for interpreting a user verbalization. The profile agents may be augmented to enable the system to provide more accurate interpretations of verbalizations made by the user. The augmentation may include a user augmentation, such as providing additional vocabulary (e.g., names in an address book), one or more personalized pronunciations or other pronunciation information, or other user provided augmentations. The augmentation may also include a non-user provided augmentation, such as updates generated by a third party (e.g., a commercial administration and/or maintenance entity), or other non-user provided augmentations. The augmentation may be automated, such as adjusting a profile parameter-weighting scheme through an adaptive misrecognition model, as discussed above.

[015] In another implementation of the invention, the domain agents in the policy module may include one or more context agents that may manage and/or provide

one or more context policies for revising a preliminary interpretation of a phoneme stream. For example, a context agent may correspond to a context, such as song titles, city and street names, movie titles, finance, or other contexts. A context agent may include one or more context parameters that may be tailored to a verbalization context. The context policy may enhance an ability of the system related to interpreting verbalizations made by the user in the verbalization context corresponding to the context agent. The context agents may be augmented to enable the system to provide more accurate interpretations of verbalizations made in a verbalization context corresponding to the context agent. The augmentation may include a user provided augmentation, a non-user provided augmentation, an automated augmentation, or other augmentations. The augmentation may be automated, such as adjusting a profile parameter-weighting scheme through an adaptive misrecognition model, as discussed above.

[016] According to various implementations of the invention, the policy module may determine which profile agents and/or which context agents to use through a set of heuristics provided in a context-tracking module. In one implementation, the context-tracking module may use phonetic fuzzy matching to track a series of verbalizations by the user to identify a verbalization context. The context-tracking module may utilize one or more M-Trees to track the series of verbalizations and determine a closest phonetic match. The context-tracking module may track one or more past verbalization contexts for the series of verbalizations, one or more current verbalization contexts for the series of verbalizations, and/or make predictions regarding one or more future verbalization contexts for the series of verbalizations. The policy module may utilize information about the verbalization context of the series of verbalizations generated by the context tracking module to manage and/or provide one or more profile and/or context agents.

[017] According to one aspect of the invention, the system may include an interpretation history analysis module that may enable the system to augment one or more domain agents based on an analysis of past interpretations related to previously interpreted verbalizations. The augmentations enabled by the interpretation history analysis module may include a user augmentation, a third-party augmentation, an automated augmentation, or other augmentations. The interpretation history analysis module may include an information storage module that may store interpretation information related to past verbalizations, such as one

or more preliminary interpretations associated with a past verbalization, one or more interpretation scores associated with a past verbalization, one or more probable interpretations associated with a past verbalization, whether or not a past verbalization was interpreted correctly, or other information. A frequency module may be included in the interpretation history module, and the frequency module may use some or all of the information stored in the information storage module to generate one or more frequencies related to one or more past verbalizations. For example, the frequency module may calculate a frequency of word usage, word combinations, phonetic homonyms, interpretation errors for a particular verbalization, or other frequencies.

[018] The Information generated and/or stored by the interpretation history analysis module may be used to augment the profile and/or context agents in order to enhance the accuracy of subsequent interpretations. In some implementations, an adaptive misrecognition model may use one or more generated frequencies to augment one or more agents. For example, one or more parameters and/or weighting schemes of an agent or phonetic model may be augmented based on a frequency generated by the interpretation history analysis module. Other augmentations using information stored and/or generated by the interpretation history analysis module may be made, and the system may include a policy agent handler that may augment, update, remove, and/or provide one or more domain agents to the system. A domain agent may comprise a profile or context agent, and the policy agent handler may be controlled, directly or indirectly by a third party (e.g. a commercial entity, etc.). The policy agent handler may augment, update, remove, and/or provide domain agents to the system as part of a commercial agreement, such as a licensing agreement, a subscription agreement, a maintenance agreement, or other agreements.

[019] Other objects and advantages of the invention will be apparent to those skilled in the art based on the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[020] Fig. 1 illustrates an exemplary system for enhancing automated speech interpretation according to one implementation of the invention.

[021] Fig. 2 illustrates an exemplary grammar tree for enhancing the performance of a speech engine according to one implementation of the invention.

[022] Fig. 3 illustrates an exemplary flow chart of a method for enhancing automated speech interpretation according to one implementation of the invention.

DETAILED DESCRIPTION

[023] Fig. 1 illustrates an exemplary system for enhancing automated speech interpretation according to one implementation of the invention. A speech-to-text processing engine 112 may receive a user verbalization, and speech engine 112 may generate one or more preliminary interpretations of the user verbalization. The preliminary interpretations may represent a set of best guesses as to the user verbalization arranged in any predetermined form or data structure, such as an array, a matrix, or other forms. In one implementation of the invention, speech engine 112 may generate the preliminary interpretations by performing phonetic dictation to recognize a stream of phonemes, instead of a stream of words. Phonemic recognition provides several benefits, particularly in the embedded space, such as offering out-of-vocabulary (OOV) capabilities, improving processing performance by reducing the size of a grammar, and eliminating the need to train Statistic Language Models (SLMs). Those skilled in the art will recognize other advantages of phonemic recognition.

[024] Speech engine 112 may apply the phoneme stream against one or more acoustic grammars that reliably map a speech signal to a phonemic representation in order to generate the plurality of preliminary interpretations. Characteristics of a speech signal may be mapped to a phonemic representation to construct a suitable acoustic grammar, and various acoustic grammars may be included in speech engine 112 to generate one or more preliminary interpretations according to the various acoustic grammars. For example, the English language may be mapped into a detailed acoustic grammar representing the phonotactic rules of English, where words may be divided into syllables, which may further be divided into core components of an onset, a nucleus, and a coda, which may be further broken down into one or more sub-categories.

[025] Once the phonotactic rules of a speech signal have been identified, a detailed acoustic grammar tree may be constructed that accounts for the nuances of the speech signal. The acoustic grammar may include a loop of phonemes, or the phoneme loop may include a linking element to reduce a size of a search space associated with the grammar. Using the English language as an example, the grammar tree may include various branches representing English language

syllables. The speech engine may traverse one or more grammar trees to generate one or more preliminary interpretations of a phoneme stream as a series of syllables that map to a word or phrase. By using phonemic recognition rather than word recognition, the size of the grammar can be reduced, which reduces the amount of time required to compile, load, and execute speech interpretation. Moreover, because the grammar maintains a high level of phonotactic constraints and therefore a large number of syllables, speech engine 112 may be very precise in generating phonemic representations of human verbalizations.

[026] An acoustic grammar used by speech engine 112 may be further optimized to reduce compile time, load time, and execution time by reducing the size of a search space associated with the acoustic grammar. Referring now to Fig. 2, a traditional grammar tree 120 is compared to an exemplary grammar tree according to one aspect of the invention to demonstrate the performance enhancements of speech engine 112. In traditional speech processing engines, nodes in a grammar tree 210 tend to represent words, or large-list applications may be supported provided through a grammar tree 210 where the nodes represent items in the large-list. This requires the speech engine to parse through a large number of transition states to come up with a recognition result, which degrades response time. An example of this is seen in the following grammar structure:

[027] "<street name> <city name>" → e.g., "NE 24th Street Bellevue"

[028] In the above example, a large list of street names is followed by a large list of city names. Assuming three elements in the list of street names, and three elements in the list of city names, this results in twenty-one transitions, which may be represented by traditional grammar tree 210. Every end-node of the first list is followed by all entries in the second list, potentially leading to very large grammars because most real-world large-list applications are likely to include much more than three list items. For example, a city may have hundreds or thousands of street names, and there may be hundreds or thousands of city names. Moreover, every element in the second segment of traditional grammar tree 210 is repeated, once for each first segment, which introduces redundancy.

[029] According to an aspect of the invention, the problems with traditional grammar trees may be resolved by using phonemic acoustic grammars instead of large-lists. The grammar may further be improved by including linking elements to reduce the number of transition states in the grammar. Thus, a grammar tree with a linking

element 220 will merge after a first segment and then spread out again at a second segment, where the segments may represent a phoneme in an acoustic grammar, as discussed above. For example, assume a two-syllable word in an acoustic grammar consisting of three phonemes, which is able to reduce the number of transitions from twenty-one in a traditional grammar tree 210 to twelve in a grammar tree with a linking element 220. Two syllables and three phonemes are chosen to show the reduction in search space in a grammar tree with a linking element 220 as opposed to a corresponding traditional grammar tree 210, although a real-world acoustic grammar modeled after a language is likely to have a maximum of roughly fifty phonemes. Moreover, the search space may be further reduced by restricting available transitions based on phonotactic constraints for an acoustic model.

[030] Using the approach described in Fig. 2, adding a linking element to an acoustic grammar may reduce both grammar size and response time. Part of a speech signal may be mapped to the linking element in order to maintain the phonotactic rules of the acoustic grammar. The linking element may be an acoustic element that is likely to be triggered even if unpronounced. For example, a *schwa* represents an unstressed, central vowel in the English language (e.g., the first and last sound in the word "arena" is *schwa*). The phoneme *schwa* is an ideal linking element because of how it is represented in a frequency spectrum. That is, *schwa* is a brief sound and when a person opens their mouth to speak, there is a strong likelihood of passing through the frequencies of *schwa* even if unintended. Those skilled in the art will recognize that this approach may be extended to acoustic models of speech signals for other languages by using frequently elided phonemes as linking elements to reduce the search space of an acoustic grammar.

[031] Referring again to Fig. 1, speech engine 112 may receive a user verbalization and process the verbalization into a plurality of preliminary interpretations using the techniques described above. That is, the verbalization may be interpreted as a series of phonemes, and the series of phonemes may be mapped to one or more preliminary interpretations by traversing one or more acoustic grammars that are modeled after grammar 220 of Fig. 2. The plurality of preliminary interpretations may take the form of words, parts of words, phrases, utterances, or a combination thereof, and the plurality of preliminary interpretations may be arranged as a matrix, an array, or in another form. The plurality of preliminary interpretations are then

passed to a speech sharpening engine 110 for deducing a most probable interpretation of the verbalization.

[032] According to various aspects of the invention, speech sharpening engine 110 may include an interpretation sharpening module 116, a policy module 114, an interpretation history analysis module 118, and a policy agent handler 120. The plurality of preliminary interpretations may be received by interpretation sharpening module 116, which forwards the preliminary interpretations to policy module 114 for further processing. Policy module 114 may include one or more context agents 126, one or more profile agents 128, and a context tracking module 130 that collectively revise the plurality of preliminary interpretations into a set of hypotheses that represent candidate recognitions of the verbalization. Policy module 114 may assign each hypothesis an interpretation score, and interpretation sharpening module 116 may designate the hypothesis with the highest (or lowest) interpretation score as a probable interpretation.

[033] According to one aspect of the invention, policy module 114 may include one or more context agents 126. Context agents 126 may represent domains of knowledge corresponding to a given context, such as song titles, city and street names, finance, movies, or other contexts. Context agents 126 may use context objects and associated dynamic languages to represent a corresponding context. Policy module 114 may also include one or more profile agents 128. Profile agents 128 may represent domains of knowledge corresponding to a given profile, such as a specific user, language, accent, or other profiles. Profile agents 128 may use profile objects and dynamic languages to represent a corresponding profile. Dynamic languages for context agents 126 or profile agents 128 may specify vocabularies, word combinations, phrases, sentence structures, criteria, and priority weightings for any given context or profile, respectively. The priority weightings may weight individual parameters according to one or more weighting factors, such as assigning a weight according to a frequency of use, a difficulty to understand, or other factors. Policy module 114 may also include a context-tracking module 130. Context tracking module 130 may track a verbalization context of a consecutive series of verbalizations. Context tracking module 130 may utilize one or more conversation trees to track the series of verbalizations. Context tracking sub-module 214 may track one or more past or current verbalization contexts of the series of verbalizations, and/or may make predictions regarding one or more future

verbalization contexts of the series of verbalizations. Policy module 114 may utilize information about the verbalization context, generated by context tracking module 130, to generate one or more sharpened interpretations and corresponding interpretation scores.

[034] In some implementations, policy module 114 may use context tracking module 130 to apply objects from one or more context agents 126 and/or profile agents 128 to the preliminary interpretations provided by speech engine 112. The various agents may compete with each other using a set of heuristics in a phonetic fuzzy matcher, where an intent or context of the user may be identified based on the set of heuristics about how a request may be phrased in a given domain. A closest phonetic match may be identified for suspect words and/or phrases among the plurality of preliminary interpretations.

[035] The phonetic fuzzy matcher may include an M-Tree that is populated with context objects, profile objects, and/or dynamic language data from one or more of context agents 126 and/or profile agents 128. M-Trees are known to those skilled in the art. The M-Tree may assign relative priority weights to the context objects, profile objects, and/or dynamic language data in order to account for the possibility of misrecognized phonemes, extraneous phonemes, or erroneously deleted phonemes. A closest distance metric associated with the M-Tree may be used given the relative weightings of phoneme misrecognition, phoneme addition, and phoneme deletion for various contexts and/or profiles.

[036] According to one aspect of the invention, one or more passes may be taken over the plurality of preliminary interpretations to identify dominant words and/or phrases among the plurality of preliminary interpretations. Using the M-Tree weighted model, one or more candidate interpretations may be made based on relevant substitution of suspect words and/or phrases based on phonetic similarities and/or domain appropriateness. For example, if a set of dominant words appear to be a movie name, a candidate interpretation will substitute the relevant words and/or phrases to generate a candidate interpretation about movies. After a set of candidate interpretations have been generated, the candidate interpretations are analyzed using the M-Tree weighted model. With the relevant domains constrained by the candidate interpretations, a confidence or interpretation score may be assigned to each candidate interpretation, with the interpretation score representing a likelihood that a particular candidate interpretation is a correct interpretation of the

verbalization. The candidate interpretations may then be returned to interpretation sharpening module 116, and interpretation sharpening module 116 may select a candidate interpretation with a highest (or lowest) interpretation score as a probable interpretation of the verbalization.

[037] According to various implementations of the invention, speech sharpening engine 110 may include an interpretation history analysis module 118. Interpretation history analysis module 118 may include an information storage module 122 a frequency module 124. Information storage module 122 may store information related to verbalizations, including components of verbalizations, preliminary interpretations, dominant words and/or phrases, candidate interpretations, probable interpretations, and/or interpretation scores associated with verbalizations, as well as whether or not a verbalization was interpreted correctly, or other information. Interpretation history analysis module 118 may also include a frequency module 124. Frequency module 124 may use some or all of the information stored in information storage module 122 to generate one or more frequencies related to one or more past verbalizations. For example, frequency module 124 may calculate a word usage frequency, a word combination frequency, a frequency related to a set of verbalizations that are phonetically similar but have distinct meanings, an interpretation error frequency for a particular verbalization, or other frequencies.

[038] Information stored and/or generated by interpretation history analysis module 118 may be used to augment speech sharpening engine 110. In some implementations, the information may be used to adjust various weights used in phonetic models, such as context agents 126 or profile agents 128, as well as adapting the relative weights in the M-Tree in context tracking module 130 to enhance accuracy for subsequent verbalizations. In another implementation, the stored information may be sent to a third-party or commercial entity for analyzing the data and developing new domain agents or further improving the accuracy of speech sharpening engine 110. For example, one or more parameters and/or weighting schemes of an agent may be augmented based on a frequency generated by interpretation history analysis module 118. Other augmentations related to information stored on and/or generated by interpretation history analysis module 118 may be made. Speech sharpening engine 110 may also include a policy agent handler 120 that may augment, update, remove, and/or provide one or more domain agents to policy module 114. A domain agent may include one or more new,

modified, or updated context agents 126 and/or profile agents 128. Policy agent handler 120 may also augment or update the M-Tree in context tracking module 130 to adjustments in priority weighting schemes or phonetic models. Policy agent handler 120 may be controlled, directly or indirectly, by a third party, such as a commercial entity, and domain agents may be augmented, updated, removed, and/or provided by policy agent handler 120 as part of a commercial agreement, licensing agreement, subscription agreement, maintenance agreement, or other agreement.

[039] Referring to Fig. 3, a flow chart demonstrating an exemplary method for enhancing the performance and accuracy of speech interpretation is provided. The method may begin by receiving a user verbalization at an operation 312. The received user verbalization may be electronically captured at operation 312, such as by a microphone or other electronic audio capture device. The electronically captured verbalization may be provided to a speech interpretation engine, such as speech engine 112 in Fig. 1.

[040] The speech interpretation may then generate one or more preliminary interpretations of the received verbalization at an operation 314. According to one implementation of the invention, the plurality of preliminary interpretations may be generated using phonetic dictation, grammar trees with linking elements, or any combination thereof to improve performance and enhance accuracy. Phonetic dictation and reducing a search space of a grammar tree by including linking elements is discussed in greater detail above. The preliminary interpretations may be arranged in any predetermined form, such as an array, a matrix, or other forms.

[041] In an operation 320, the preliminary interpretations may be provided to a speech sharpening engine. The speech sharpening engine may take one or more passes over the plurality of preliminary interpretations to identify dominant words and/or phrases in operation 320. This information may then be used to generate one or more candidate interpretations. The candidate interpretations may be based on various domain agents, such as context agents and/or profile agents, which may be organized as a weighted domain model, such as an M-Tree. For example, if a set of dominant words sound like a movie name, apply policies operation 320 may generate a candidate interpretation that substitutes relevant words and/or phrases based on a domain agent populated with movie titles. Additional passes may be made over the candidate interpretations, which may be constrained by domain

information associated with the candidate interpretations, to thereby generate a confidence score or interpretation score for each candidate interpretation. The interpretation score may represent a likelihood that a particular candidate interpretation is a correct interpretation of the verbalization received in operation 312. The operation of apply policies 320 is described in greater detail above in reference to Fig. 1.

[042] The candidate interpretations and corresponding interpretation scores may then be analyzed to determine a probable interpretation in an operation 322. In one implementation of the invention, a candidate interpretation with a highest (or lowest) score may be designated as a probable interpretation. The probable interpretation may then be output in an operation 324, such as for use in a voice-activated vehicular navigation system, a voice-controlled server or desktop computer, or other electronic device that can be controlled using voice commands.

[043] Information relating to the verbalization and the interpretations of the verbalization may be provided in a store interpretation operation 325. Store interpretation operation 324 may store interpretation information related to verbalizations, such as components of verbalizations, preliminary interpretations, dominant words and/or phrases, candidate interpretations, probable interpretations, and/or interpretation scores associated with verbalizations, as well as whether or not a verbalization was interpreted correctly, or other information. In some implementations of the invention, some or all of the interpretation information stored at store interpretation operation 324 may be used to determine one or more frequencies at a determine frequencies operation 326. The frequencies calculated at determine frequencies operation 326 may include one or more frequencies related to past verbalizations, such as, a word usage frequency, a word combination frequency, a frequency related to a set of verbalizations that are phonetically similar but have distinct meanings, an interpretation error frequency for a particular verbalization, or other frequencies. Determine frequencies operation 326 may be performed by interpretation history analysis module 118.

[044] In various implementations, a decision may be made whether to augment a speech sharpening engine in an augmentation decision operation 328. The decision concerning system augmentation may be based at least in part on information generated at determine frequencies block 326, such as one or more frequencies, or other information. If it is decided that no augmentation is needed, no further action is

taken until another verbalization is captured, and the method ends. In some instances, decision operation 328 may determine that augmentation may be made and control passes to an augment system operation 330. Augment system operation 330 may include making an augmentation to a speech sharpening engine. For example, one or more domain agents may be augmented to reflect probabilities of an interpretation being a correct interpretation of a verbalization, to update a user profile, or other augmentation. Dynamic languages associated with context agents and/or profile agents may be augmented, or parameters weights may be augmented to enhance accuracy when interpreting subsequent verbalizations. For example, an adaptive misrecognition technique may adjust the various weights in a phonetic model or update similarity weights for regional accents, or other augmentations may be made. In parallel to augment system operation 330, new agent policies may be received in an operation 332. For example, a third party or commercial entity may redesign or modify various domain agents, new domain agents may be developed and installed as plug-ins, domain agents that are unreliable may be removed, or other augmentations or modifications may be made. Thus, the method continually refines the domain agents and the weighting of various parameters in order to refine the accuracy of the speech sharpening engine for subsequent verbalizations.

[045] The above disclosure has been described in terms of specific exemplary aspects, implementations, and embodiments of the invention. However, those skilled in the art will recognize various changes and modifications that may be made without departing from the scope and spirit of the invention. For example, references throughout the specification to "one implementation," "one aspect," "an implementation," or "an aspect" may indicate that a particular feature, structure, or characteristic is included in at least one implementation. However, the particular features, structures, or characteristics may be combined in any suitable manner in one or more implementations. Therefore, the specification and drawings are to be regarded as exemplary only, and the scope of the invention is to be determined solely by the appended claims.

CLAIMS

What is claimed is:

1. A computer-implemented method for interpreting speech, the method comprising:

receiving a user verbalization;

parsing the verbalization into a plurality of phonemes; and

generating at least one interpretation of the verbalization based on the plurality of phonemes.

2. The method of claim 1, wherein generating the at least one preliminary interpretation includes traversing an acoustic grammar based on the plurality of phonemes.

3. The method of claim 2, wherein the acoustic grammar is a phonemic representation of a speech signal.

4. The method of claim 3, wherein the acoustic grammar includes a linking element between segments, the linking element being an acoustic element in the speech signal.

5. The method of claim 4, wherein the acoustic element is a phoneme representing an unstressed vowel.

6. The method of claim 1, further comprising:

revising the at least one interpretation, wherein the revising includes generating a plurality of candidate interpretations of the verbalization;

assigning an interpretation score to each candidate interpretation; and

selecting a candidate interpretation with a highest interpretation score as a probable interpretation of the verbalization.

7. The method of claim 6, wherein revising the at least one interpretation includes:

applying the at least one interpretation against at least one domain agent;

identifying suspect words and/or phrases in the at least one interpretation;

identifying a closest phonetic match for the suspect words and/or phrases based on a relative weighting of parameters in at least one domain associated with the at least one domain agent; and

substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation.

8. The method of claim 7, wherein the closest phonetic match is stored in an M-Tree, and wherein identifying the closest phonetic match includes using a closest-distance metric associated with the M-Tree.

9. The method of claim 7, wherein the parameters include at least one of a context of the verbalization, a verbalization criteria, a history of user verbalizations, a user profile, or domain specific information.

10. The method of claim 7, further comprising adjusting the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization.

11. A method for sharpening a preliminary interpretation of a user verbalization, the preliminary interpretation generated by a speech interpretation engine, the method comprising:

revising the preliminary interpretation, wherein the revising includes generating a plurality of candidate interpretations of the verbalization;

assigning an interpretation score to each candidate interpretation; and

selecting a candidate interpretation with a highest interpretation score as a probable interpretation of the verbalization.

12. The method of claim 11, wherein revising the preliminary interpretation includes:

applying the preliminary interpretation against at least one domain agent;

identifying suspect words and/or phrases in the preliminary interpretation;

identifying a closest phonetic match for the suspect words and/or phrases based on a relative weighting of parameters in at least one domain associated with the at least one domain agent; and

substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation.

13. The method of claim 12, wherein the closest phonetic match is stored in an M-Tree, and wherein identifying the closest phonetic match includes using a closest-distance metric associated with the M-Tree.

14. The method of claim 12, wherein the parameters include at least one of a context of the verbalization, a verbalization criteria, a history of user verbalizations, a user profile, or domain specific information.

15. The method of claim 12, further comprising adjusting the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization.

16. A system for interpreting speech, the system comprising:

a device that receives a user verbalization and generates an electronic signal corresponding to the user verbalization; and

a speech interpretation engine that receives the electronic signal corresponding to the user verbalization, wherein the speech interpretation engine parses the signal into a plurality of phonemes and generates at least one interpretation of the verbalization based on the plurality of phonemes.

17. The system of claim 16, wherein generating the at least one preliminary interpretation includes traversing an acoustic grammar based on the plurality of phonemes.

18. The system of claim 17, wherein the acoustic grammar is a phonemic representation of a speech signal.

19. The system of claim 18, wherein the acoustic grammar includes a linking element between segments, the linking element being an acoustic element in the speech signal.

20. The system of claim 19, wherein the acoustic element is a phoneme representing an unstressed vowel.

21. The system of claim 16, further comprising a speech sharpening engine configured to:

revise the at least one interpretation by generating a plurality of candidate interpretations of the verbalization;

assign an interpretation score to each candidate interpretation; and

select a candidate interpretation with a highest interpretation score as a probable interpretation of the verbalization.

22. The system of claim 21, wherein the speech sharpening engine is configured to revise the at least one interpretation by:

applying the at least one interpretation against at least one domain agent;

identifying suspect words and/or phrases in the at least one interpretation;

identifying a closest phonetic match for the suspect words and/or phrases based on a relative weighting of parameters in at least one domain associated with the at least one domain agent; and

substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation.

23. The system of claim 22, wherein the closest phonetic match is stored in an M-Tree, and wherein identifying the closest phonetic match includes using a closest-distance metric associated with the M-Tree.

24. The system of claim 22, wherein the parameters include at least one of a context of the verbalization, a verbalization criteria, a history of user verbalizations, a user profile, or domain specific information.

25. The system of claim 22, wherein the speech sharpening engine is further configured to adjust the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization.

26. A system for sharpening a preliminary interpretation of a user verbalization received by an electronic capture device, the preliminary interpretation generated by a speech interpretation engine, the system comprising a speech sharpening engine containing at least one processor configured to:

revise the preliminary interpretation by generating a plurality of candidate interpretations of the verbalization;

assign an interpretation score to each candidate interpretation; and

select a candidate interpretation with a highest interpretation score as a probable interpretation of the verbalization.

27. The system of claim 26, wherein the speech sharpening engine is further configured to revise the preliminary interpretation by:

applying the preliminary interpretation against at least one domain agent;

identifying suspect words and/or phrases in the preliminary interpretation;

identifying a closest phonetic match for the suspect words and/or phrases based on a relative weighting of parameters in at least one domain associated with the at least one domain agent; and

substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation.

28. The system of claim 27, wherein the closest phonetic match is stored in an M-Tree, and wherein identifying the closest phonetic match includes using a closest-distance metric associated with the M-Tree.

29. The system of claim 27, wherein the parameters include at least one of a context of the verbalization, a verbalization criteria, a history of user verbalizations, a user profile, or domain specific information.

30. The system of claim 27, wherein the speech sharpening engine is further configured to adjust the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization.

31. A computer-readable medium containing computer-executable instructions for interpreting speech, the computer-executable instructions configured to:

receive a user verbalization;

parse the verbalization into a plurality of phonemes; and

generate at least one interpretation of the verbalization based on the plurality of phonemes.

32. The computer-readable medium of claim 31, wherein the computer-executable instructions are configured to generate the at least one preliminary interpretation by traversing an acoustic grammar based on the plurality of phonemes.

33. The computer-readable medium of claim 32, wherein the acoustic grammar is a phonemic representation of a speech signal.

34. The computer-readable medium of claim 33, wherein the acoustic grammar includes a linking element between segments, the linking element being an acoustic element in the speech signal.

35. The computer-readable medium of claim 34, wherein the acoustic element is a phoneme representing an unstressed vowel.

36. The computer-readable medium of claim 31, wherein the computer-executable instructions are further configured to:

revise the at least one interpretation by generating a plurality of candidate interpretations of the verbalization;

assign an interpretation score to each candidate interpretation; and

select a candidate interpretation with a highest interpretation score as a probable interpretation of the verbalization.

37. The computer-readable medium of claim 36, wherein the computer-executable instructions are configured to revise the at least one interpretation by:

applying the at least one interpretation against at least one domain agent;

identifying suspect words and/or phrases in the at least one interpretation;

identifying a closest phonetic match for the suspect words and/or phrases based on a relative weighting of parameters in at least one domain associated with the at least one domain agent; and

substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation.

38. The computer-readable medium of claim 37, wherein the closest phonetic match is stored in an M-Tree, and wherein identifying the closest phonetic match includes using a closest-distance metric associated with the M-Tree.

39. The computer-readable medium of claim 37, wherein the parameters include at least one of a context of the verbalization, a verbalization criteria, a history of user verbalizations, a user profile, or domain specific information.

40. The computer-readable medium of claim 37, wherein the computer-executable instructions are further configured to adjust the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization.

41. A computer-readable medium containing computer-executable instructions for sharpening a preliminary interpretation of a user verbalization, the preliminary interpretation generated by a speech interpretation engine, the computer-executable instructions configured to:

revise the preliminary interpretation by generating a plurality of candidate interpretations of the verbalization;

assign an interpretation score to each candidate interpretation; and

select a candidate interpretation with a highest interpretation score as a probable interpretation of the verbalization.

42. The computer-readable medium of claim 41, wherein the computer-executable instructions are configured to revise the preliminary interpretation by:

applying the preliminary interpretation against at least one domain agent;

identifying suspect words and/or phrases in the preliminary interpretation;

identifying a closest phonetic match for the suspect words and/or phrases based on a relative weighting of parameters in at least one domain associated with the at least one domain agent; and

substituting the closest phonetic match for the suspect words and/or phrases to generate a candidate interpretation.

43. The computer-readable medium of claim 42, wherein the closest phonetic match is stored in an M-Tree, and wherein identifying the closest phonetic match includes using a closest-distance metric associated with the M-Tree.

44. The computer-readable medium of claim 42, wherein the parameters include at least one of a context of the verbalization, a verbalization criteria, a history of user verbalizations, a user profile, or domain specific information.

45. The computer-readable medium of claim 42, wherein the computer-executable instructions are further configured to adjust the relative weighting of parameters in response to the selection of a probable interpretation of the verbalization.

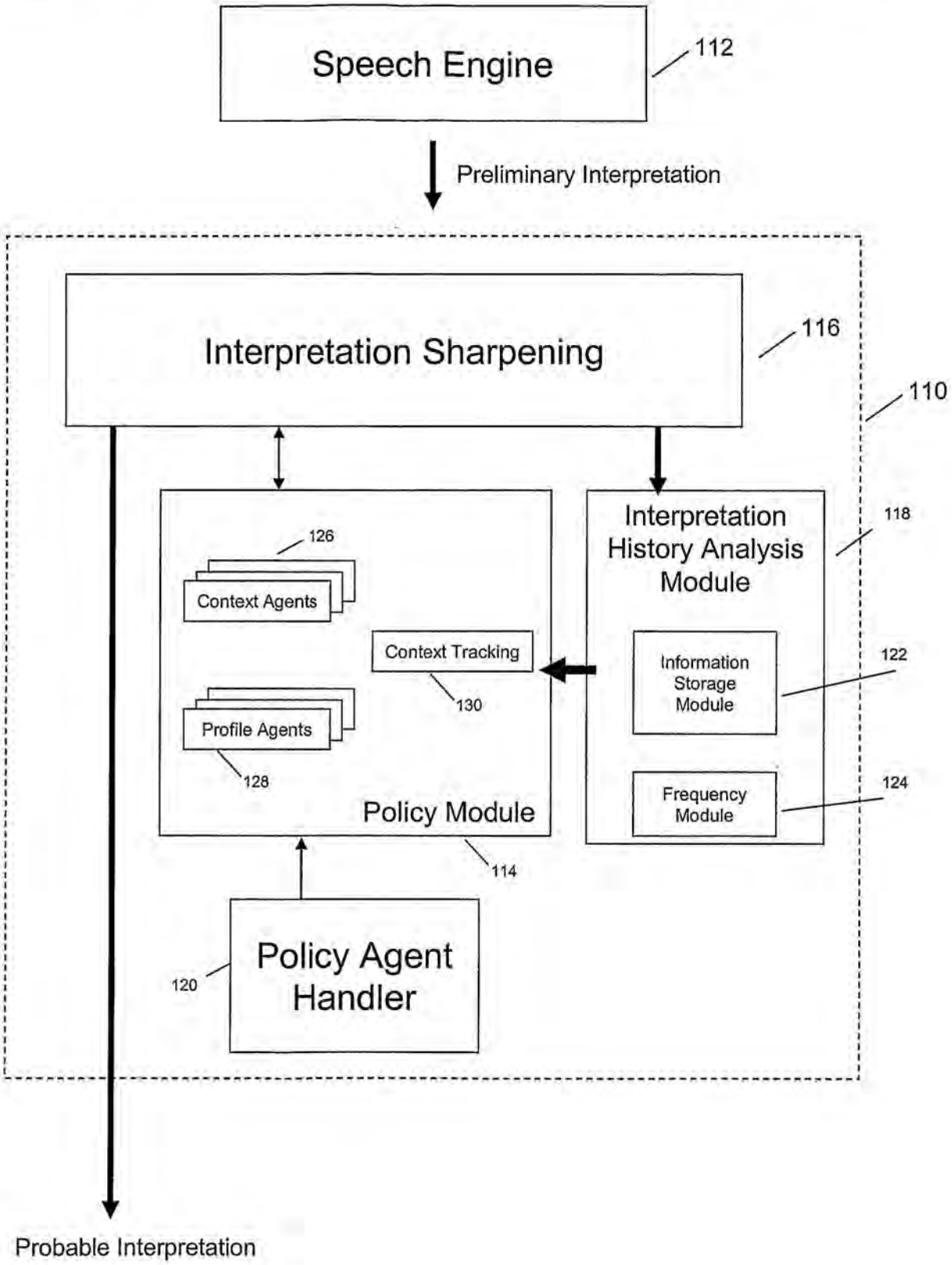
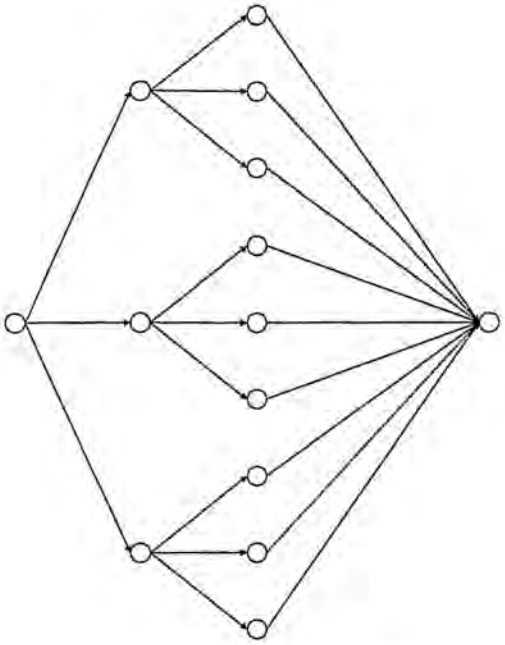

Speech Engine
112
Preliminary Interpretation
Interpretation Sharpening
116
110
Interpretation History Analysis Module
118
126
Context Agents
Context Tracking
130
Information Storage Module
122
Profile Agents
128
Frequency Module
124
Policy Module
114
Policy Agent Handler
120
Probable Interpretation

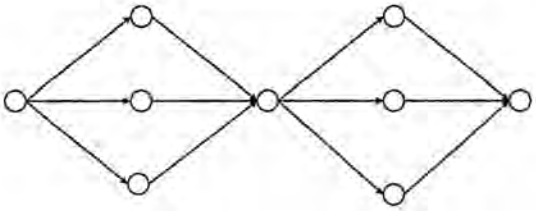
Fig. 1

Traditional Grammar Tree



210

Grammar Tree with Linking Element



220

Figure 2

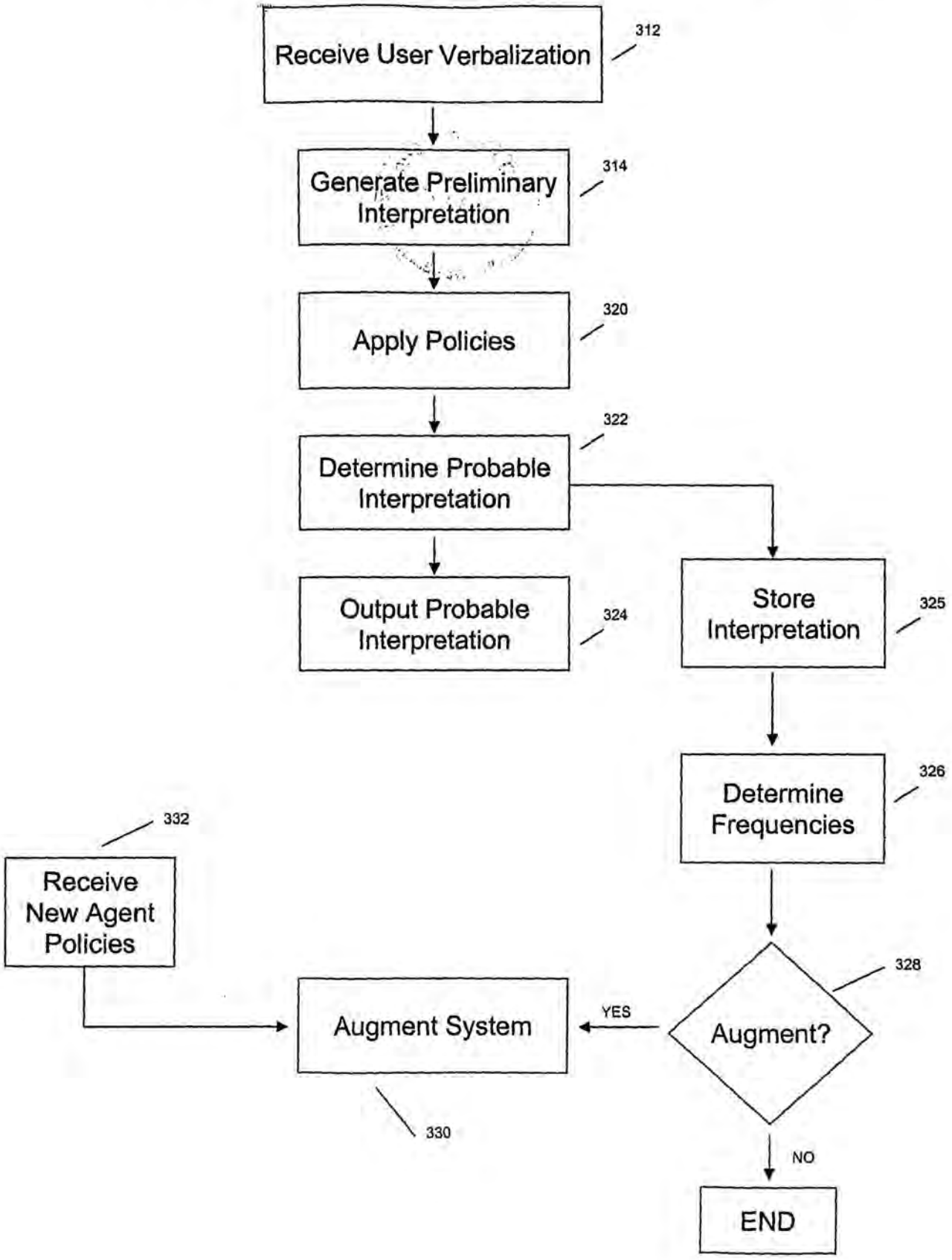

Receive User Verbalization
312
Generate Preliminary Interpretation
314
Apply Policies
320
Determine Probable Interpretation
322
Output Probable Interpretation
324
Store Interpretation
325
Determine Frequencies
326
Augment?
328
YES
NO
Augment System
330
Receive New Agent Policies
332
END

Fig. 3